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Manufacture of Disinfectants

THE paper on industrial disinfectants which Mr. J. Gibson read before the London Section of the Society of Chemical Industry on December 2 last, reveals disinfectant manufacture as a branch of chemical industry that has not yet found itself. To some extent it has not yet grown up. What, for example, is a disinfectant and how is its disinfecting power to be gauged? To that question Mr. Gibson answers that a disinfectant is a substance that has the power of killing germs; he, and the rest of the disinfectant manufacturers with him, do not, we gather, care in the least how the germicide works so long as it is effective. That is all very well so far as it goes, but when the question is asked how the germicidal power is to be determined the answer is that whilst the manufacturers and many users in this country would like the Rideal-Walker test to be regarded as sacrosanct, many, such as the Admiralty and the Office of Works, do not agree. There seems to have been difficulty in devising a better test, and the divergence of opinion shows that the Rideal-Walker test is not regarded as uniformly satisfactory. Perhaps its chief weakness is not inherent in the method of conducting the test, but lies in the material tested.

It is assumed that the value of all disinfectants may be completely determined when tested against *B. typhosis*. This assumption may well be fallacious because it is not certain that all bacteria are affected in the same way. No doubt *B. typhosis* is one of the principal villains of the piece, but there may be as many variations in resistance among the bacteria as there are in other parts of the animate world. All bacteria are not of the same size, and, to increase the scale proportionately, a dose of a specific poison that will kill a mouse may have no effect on an elephant. There are poisons that will kill a rat, but that are without effect on the domestic animals. The effect also depends upon whether the bacterial culture tested is old and quiescent or fresh and virulent. No disinfectant has yet been found that will kill the anthrax bacillus without destroying the skin or leather in which the bacillus is contained. Each disinfectant should apparently be tested against a culture of the specific bacillus against which it is to be used in practice.

It is surprising to learn that many substances which have a high reputation as disinfectants are not in truth disinfectants at all. Such are mercuric chloride and formalin. Mr. Gibson made the useful suggestion that the germicidal value—in his view, represented by the Rideal-Walker coefficient—should be printed on every bottle sold. If that were done, he declared, many supposed disinfectants would disappear from the market. Hypochlorite is a form of disinfectant for which Mr. Gibson has not much use, but he agrees that it has done valuable service in swimming baths and has made the water there akin to drinking water. This is somewhat surprising since it loses its activity in presence of organic matter, from which the water of public baths is certainly not free. Hypochlorite is also of value in drinking water; it may be that the subject has not yet been fully investigated. Apart from the serious objection to mercuric chloride that it is extremely poisonous, there is the curious fact that its germicidal value was formerly supposed to be very high, and it is now thought to be very low. This is surely an illustration that the conditions of use are all-important and that no single method of test can determine the efficiency of a disinfectant unless applied under the conditions that will obtain in practice. So many of the known disinfectants lose their efficiency in presence of organic matter, of soap and of inorganic salts, and apparently not one of those in common use is free from objection.

Mr. Gibson's address left the impression that the manufacture of disinfectants is a subject upon which there is much to be discovered. Beyond bare outlines he was unable to reveal any of the processes of manufacture because each manufacturer appears to believe that he possesses some little knowledge that his rivals have not, and jealously guards his secrets. This is akin to the belief held in the British explosives industry before Imperial Chemical Industries incorporated so many of the rival firms and pooled their knowledge. It was found that the belief was entirely fallacious, and that true advance is gained, not by carefully guarding "secrets," but by free and open collaboration to solve all the problems of the industry. The Parable of the Talents is still of wide applicability 2,000 years after it was uttered.

A second point upon which adverse comment may be made is Mr. Gibson's statement in reply to a question that manufacturers were concerned with making disinfectants, not with solving their customers' problems. No doubt this statement is not to be taken too literally, but clearly each manufacturer will be primarily interested only in his own product. All modern industries find that development work in assisting in the applications of their products is of the highest value. It may with diffidence be suggested that the formation of a disinfectant research association is indicated; a body that will deal with the utilisation of disinfectants as well as with the pooling of knowledge. One of the first subjects to be investigated would doubtless be the economic manufacture at reasonable prices of powerful disinfectants of the chlorinated phenol type.

Notes and Comments

Examiners Examined

WHAT " knocking into a cocked hat " precisely is, we have never learnt. The operation as we suppose it to be was never more neatly nor more successfully carried out than it is for examinations, in a delightfully ingenuous shilling pamphlet before us, by Sir Philip Hartog and Dr. Rhodes, a statistician. Such is the independence of examiners, it appears, that when their results are critically examined by themselves no two of them are found to agree—nor do they agree with themselves at different times of the day. This is just what everyone engaged in the game knows full well. Equally shown up is the examination by personal interview. It is pleasing to know that "the call of the fee" was duly to the fore, during the inquiry; in fact, the committee regarded the payment of the examiners as an essential feature of the investigation. They say: "It might have been possible to secure the voluntary help of competent examiners but marking carried out by voluntary helpers would have been carried out under conditions different from those of a real examination. In an investigation of this kind, it is to be remembered that the actual task of marking examination scripts is for most examiners wearisome and the psychological condition of a person who is unpaid for performing such work is likely to be different from the condition of a person who is adequately paid." The dimensions of the farce called the Certificate Examination are fairly well displayed. We are told that twelve millions are now to be spent upon technical education—how can a country that treats its youth as ours does hope to give technical education of any worth? Ought not some consideration of teaching to precede the throwing away of any such sum?

Workers' Grievances

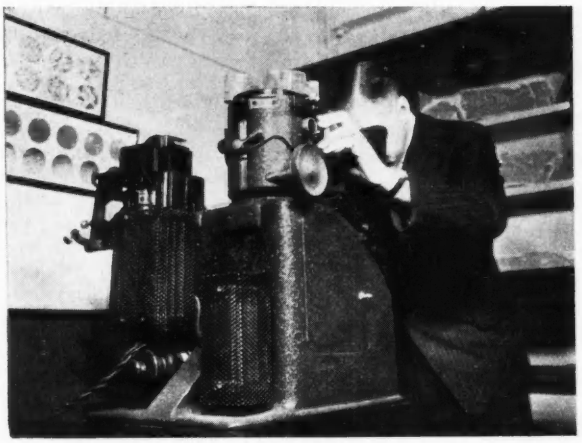
A WISE business concern ranks the goodwill of its employees on much the same level as the goodwill of its customers, and no management can ignore the harmful influence of unchecked grievances. Most of the trouble, however, arises from unfounded rumours and ideas which travel through the work rooms and rarely reach the ears of the man at the top. It is in this somewhat unexpected field that the help of a scientific body such as the National Institute of Industrial Psychology proves of great value, and the annual report of the Institute just issued deals at length with the subtle problem and the steps taken to solve it. By putting himself in the place of the workers the industrial psychologist can detect many factors likely to cause dissatisfaction in any working environment. The same factors which produce dissatisfaction and a bad attitude towards the firm contribute also to a high labour turnover. Even in these days of widespread unemployment the number of people voluntarily leaving their work is not unfrequently high. It was largely to reduce such a high labour turnover that the Institute developed the method of interviewing workers in one of its investigations, and the high labour turnover has already been greatly reduced. The work of the Institute covers a wide variety of industries, including the manufacture of chemicals. The Institute has established a new consultative service specially designed to meet the needs of firms which wish to call up the Institute for information and advice on problems that do not require a long investigation. This service will be available for an agreed annual subscription.

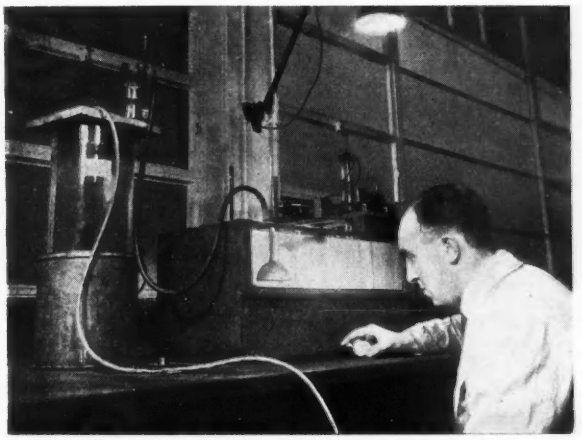
Air Hygiene

PUBLIC opinion is concerning itself more than ever about air cleanliness, both as regards pollution by smoke and dust as well as by offensive gases. Local authorities, too, are becoming more interested and now frequently appeal to the Ministry of Health for advice and resistance in dealing with difficult problems. We received this week the Journal of the National Smoke Abatement Society recording increased activities in this country, and by the same post we leart from the United States of an important movement along parallel lines. To stimulate research on problems in the field of air hygiene, Air Hygiene Foundation of America, Inc., has been formed by a large group representing various industries, with headquarters at Pittsburgh. A comprehensive investigation has been begun at the Mellon Institute, in which the hygienic, technological and economic aspects of air contamination, especially by dust in the industries, will be studied. Mr. H. B. Meller, managing director of the Foundation, will head the investigation. For fifteen years he has been in charge of the programme for the abatement of smoke and dust at Pittsburgh, and since 1923 he has been at the head of the air pollution investigation at the Mellon Institute.

The Fuel Luncheon Club

CLOSER contact between the technical men of the fuel industries will, it is hoped, be achieved by the formation of the Fuel Luncheon Club, which held a preliminary luncheon a few days ago. At present there is too litte contact. Each branch of fuel interests keeps to itself, pursues its own aims, benefits from its own discoveries and tends to ignore the advances of others. No section appears to regard itself as part of an organisation having a single aim, nor does any section co-operate with others for the benefit of all. As Sir John Cadman pointed out at the recent luncheon, there is mutual dependence throughout our fuel industries. One industry depends upon another for the purchase of its products. That other relies upon a third for a convenient material to increase calorific content. A fourth depends upon the operations of all others for sales. This commercial interdependence ought to have some parallel in the other activities of those engaged in the industry. They ought not to be fierce competitors, self-seeking, regardless of the welfare of other sections. They serve a common purpose and they ought to have common aims. One of those aims should be to extract all that may be extracted economically from their raw material, whatever it may be; another should be to supply manufacturers and the public with the best fuels at reasonable prices. We share Sir John's hope that at every meeting of the new club something will be said by the speaker for the day with which some members will be in strong disagreement. If that happens, the club will provide its members with an added mental stimulus. If they think, meet, discuss and ultimately co-operate, the club will have served a good purpose.





In the new London Midland and Scottish Railway Research Laboratory at Derby. On the left is the Vickers Projection Microscope in the Metallography Room, and on the right the apparatus for testing the viscosity of paint and varnish.

L.M.S. Research Laboratory

Opened at Derby by Lord Rutherford

LORD RUTHERFORD opened the new research laboratory of the London Midland and Scottish Railway Co. at Derby on Tuesday afternoon, and thus inaugurated a new era in the application of scientific methods to railway administration. The company's research department is the outcome of steady growth from modest beginnings. It was not until after the grouping of the railways in 1923 that the need was felt for a definite research policy, not only to co-ordinate investigations by railway officers, but also to study and apply to railway problems the results of scientific advances made by research workers in outside institutions. In 1928 Sir Josiah Stamp, chairman of the company, set up a small committee under the late Mr. R. W. Reid, to report on the need for more extensive scientific research and on the type of organisation necessary to carry out such a policy. As a result, Sir Harold Hartley was appointed vice-president and director of scientific research in 1930, and an advisory committee was set up.

The new laboratory effects a concentration of resources and increases the facilities for research, but it is not the intention of the company to render its research organisation independent of outside scientific assistance. The problems that arise are so diverse in character that a large staff of specialists would be required to deal effectively with all of them. The department therefore utilises the national organisation established under the Department of Scientific and Industrial Research and is a member of seven research associations, while certain problems are allocated to the research laboratories at the universities.

The new laboratory building was designed by Mr. H. J. Connal, of the chief engineer's department, and consists of a two-storey block designed to permit the addition of another storey when required, with an engineering test room and workshop block. The laboratory block has a total floor area on each floor of about 5,600 sq. ft. and the engineering test room and workshop block occupies an area of 3,500 sq. ft. Every effort has been made to ensure that the premises are fire resisting to the greatest possible extent.

The metallography room is equipped for the microscopical study of metals and alloys and for the preparation of photomicrographs. The latter are taken on a large Vickers projection microscope, and two dark rooms, one of which also serves the engineering section, are provided for photographic development. A Zeiss workshop microscope is provided for bench work, and there is the usual polishing and etching apparatus for the preparation of the specimens. The chemical laboratory is intended for the preliminary chemical investigation of materials, though the majority of analyses required will be carried out in the main chemical laboratory in Calvert Street. A small balance room is provided, and, in addition to the usual equipment, a thermostatically controlled Hearson electric oven has been installed. The macro-etching of ingots and forgings is carried out in this room, as well as the production of fluxes, experimental electrodes, etc.

Apparatus is installed in the pyrometry room for the calibration of pyrometers and for determining the change-point temperatures of alloys. The main equipment is a Tinsley thermo-electric potentiometer with galvanometer and Cambridge chronograph. A 3½ kW "Silit" high temperature, and various electric tube furnaces are available for heating the specimens, whilst a "Hyvac" oil pump enables this to be done *in vacuo*. A Cambridge "thread" temperature recorder, temporarily in use on field tests, will also be available, and provision has been made for connecting it by leads to apparatus in any of the metallurgical laboratories or test rooms. At a later date it is intended to install a dilatometer and electrical resistivity apparatus.

There is a small private laboratory for corrosion work to supplement the full scale tests in the open. In the constant temperature and humidity room a "Services" type of humidity control apparatus is installed, which, in conjunction with thermostatically controlled electric auxiliary heaters, maintains constant conditions of 70° F. and 65 per cent. relative humidity, which are automatically recorded throughout the week. The tests are carried out on two Goodbrand cloth testing machines, a Goodbrand yarn testing machine, and a Goodbrand single thread testing machine. Whilst no attempt will be made to provide a fully equipped library, owing to the wide range of interests covered by the four sections, a small number of standard works and reference books is being provided, and a representative list of current journals will be available, and the majority subsequently filed in this room. A librarian-translator will be available for indexing and translation work, and for assisting members of the staff who wish to consult the literature of their subject. The room will also be used for conferences and meetings.

The equipment in the workshop block comprises standard machines. A Wöhler fatigue testing machine, and a modified Haigh electro-magnetic fatigue testing machine are available, and a further machine for studying fatigue effects of interference fits is under construction. Ordinary tensile and compression tests are performed on a 15-ton Buckton machine of the single lever type, which can also be adapted for transverse bending tests and torsion tests. An Izod pendulum serves for general impact testing, and hardness can be studied on a 5,000 kg. Brinell machine, a Vickers diamond pyramid indenter and a Firth "Hardometer." There is a variety of small apparatus, including instruments designed by the section for specialised field work. Amongst these may be mentioned a portable hardness indenter; a Herbert pendulum hardness tester; two extensometers; a sensitive stroboscope; a seismograph; an instrument for measuring rail wear, corrugation and dip at rail joints; a statistical deflectometer for recording spring deflections; and an accelerometer for measuring maximum impact accelerations. A cathode-ray oscillograph has also been obtained and is at present being adapted for use with an accelerometer.

Textile Testing

A well-equipped workshop has been provided for the preparation of test pieces and for the manufacture of instruments, apparatus and testing machines. Though primarily engaged on work for the engineering section it is available for all other sections of the research department.

Facilities are provided in the furnace room of the metallurgical section for the melting, casting and heat treatment of metals. Testing equipment for foundry sands is also available, and experimental welding work can be conducted if required.

Mainly physical tests are carried out in the textile testing laboratory, such as those relating to the weight, composition, moisture content, amount of dressing, shrinkage, etc., of the various textile materials. Balata belting is examined for the quality of the canvas and the adhesion between the plies. Ropes are inspected for the grade of fibre and angle of lay, and the fibres of cords, twines and threads are examined for quality. The microscopic examination of all fibres is also performed in this room. A fugitometer is provided for testing the fastness to light of dyed fabrics, and a wear testing machine is installed by means of which an indication of the wearing properties of materials can be obtained. There is also a small washing machine for studying laundering problems. A waste shaker and a sterilising oven complete the equipment.

Paint Research

The apparatus in the paint research laboratory is mainly devoted to the physical testing of paints and paint films, which, particularly with the newer materials, seem likely to supersede the more usual chemical analysis. The principal items of interest are methods of preparing detached films, measurement of film thickness, measurement of permeability to moisture, apparatus for studying the plasticity and elasticity of varnishes, and methods of evaluating the hiding power of paints. Exposure tests are controlled from the paint exposure laboratory. Accelerated tests are carried out in a "Weatherometer" which produces in five weeks results which are comparable with those of twelve months' outdoor exposure. A chemical and routine laboratory is occupied with the routine testing of materials bought to specification.

In the textile research laboratory investigations of a non-routine character on textile problems are undertaken, such as tracing the cause of premature failure of materials in use with a view to suggesting a remedy. The room is equipped with the usual facilities for carrying out chemical analysis and tests and with certain specialised apparatus for the detailed visual examination of yarns and fabrics.

Visitors to the opening ceremony travelled from London to Derby by special train, drawn by an engine which was officially named at St. Pancras "Lord Rutherford of Nelson" by Pat Fowler, the young grandson of Lord Rutherford. The opening ceremony was actually performed from the train, the speeches being relayed throughout the train by loud speakers after luncheon on board.

Sir JOSIAH STAMP, who presided, said there were representatives present from the scientific and technical worlds, from the practical application of scientific discovery right across to pure research. He welcomed particularly Sir William Bragg, now president of the Royal Society, and Sir James Jeans. He had a particularly personal interest in the proceedings. Soon after taking over his present responsibilities at Euston, a committee was set up to advise what steps might best be taken to forward scientific research in all its numerous applications to railway practice. When he was president of the Institute of Transport in 1929, he devoted his presidential address to the subject of scientific research in transport. He was glad that since then some of his dreams had come true.

Functions of the research department were first of all to isolate and define their problems; secondly, to determine how they should be attacked—whether by internal research or by the aid of external agencies; thirdly, to act as scientific consultants to all departments; and fourthly, to be a central information bureau, with a specialised monthly review for the purposes of the department as a whole. The new laboratory was an objective index of the state of progress they had reached and now further attempted, but particularly they desired that it should be a sign to all their widespread departments that they had the highest skill to consult on all their problems in regard to engineering, metallurgical questions, paint and textiles. The day of haphazard and "rule of thumb" test, under unmeasured conditions in inappropriate surroundings was over, and the day of controlled and directed experiment under arranged conditions had fully arrived.

Referring to the opener, Sir Joseph said that Lord Rutherford was chairman of the Advisory Committee on Scientific and Industrial Research. The more they were in contact with him and his work the more they felt it impossible for this age even to realise, let alone to pay, the debt it owed to him for his vast contributions to modern knowledge.

Scientific Method in Industry

Lord RUTHERFRD said that, as a firm believer in the power of science, and of the scientific method in its application to industry, he was convinced there was hardly a single unit, whether of machinery, or lay-out, or even of organisation, that could not be improved for its purpose by the application of scientific research. In such a great and varied organisation there was almost unlimited scope for scientific inquiry. Indeed, he imagined that the difficulty was not to find subjects for attack, but rather to select the more important and pressing problems for which solutions would be of immediate value. When valuable results had been obtained there still remained the formidable difficulty of introducing them into a system which had developed over long years a successful routine among its staff, and this was a question of cardinal importance in the application of research to industry. To obtain the best results from such a laboratory as he was opening, it was essential to develop mutual respect and understanding between the scientific man and the practical man.

It had been pointed out by the well-known philosopher, Professor A. W. Whitehead, that every efficient industrial and commercial undertaking must of necessity be run on routine lines, but Lord Rutherford said that he was inclined to agree that there was a real danger that industries might tend to become more and more automatic in their routine. In such an ideal routine organisation the introduction of new ideas, processes, or material might prove very disturbing, and he agreed with Professor Whitehead that new departments of foresight, equipped with men of different training and outlook from those so successful in olden days, but skilful in introducing new improvements without disturbance to routine, were needed. This was the natural function of an efficient industrial research department.

Furnaces for the Vitreous Enamelling Industry

Some Important Features of Design and Operating Technique

VARIOUS kinds of furnaces used in the vitreous enamelling industry were described by Mr. Th. Teisen, B.Sc., M.Ing.F., in a paper read before the Institute of Vitreous Enamellers at Manchester on November 7.

Furnace technique, said Mr. Teisen, has as its aim firstly to produce the heat and next to distribute it in the most suitable manner before it is dissipated and lost. The newer types of furnaces are usually designed on the recuperative or regenerative principle. The latter already invented by Siemens in the middle of the last century, although used extensively in larger furnaces for other industries, is unsuitable for enamelling furnaces, and can therefore be left out. The recuperative principle, on the other hand, is applicable to most of the furnaces used in enamelling works, and, if designed correctly, confers great advantages to them so far as economy is concerned. Refractory recuperators may be

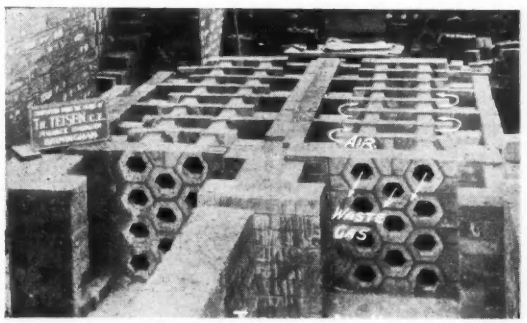
Recuperator with horizontal waste gases (making 2 or 3 turns) and zigzag vertical air channels.

divided into tubular and plate or tile types. The latter are generally less efficient, and modern tendency has been to go over to the tubular type.

There are several factors on which the efficiency of a recuperator depends. (1) It must have a large active heating surface, and, as the place in which the recuperator has to fit is generally limited, the heating surface per unit of space must be as great as possible. (2) The wall which separates the two gases and through which the heat has to be conducted must be as thin as possible consistent with strength, and of uniform thickness, to avoid local overheating and setting up tension in the tubes, resulting in cracking. (3) The passages themselves, especially those of the air to be heated, should be narrow, and steps should be taken to effect the most intimate contact between the heating surfaces and the gaseous fluid. (4) It must provide for safety against leakage between the gas and air channels. (5) In regard to practical requirements, we must demand that they are easy to inspect or clean, and simple to make and to erect.

To comply with these conditions, the author designed a recuperator of hexagonal shape which combined the essential features outlined above and may be built into recuperator units in a variety of ways. The hexagonal design is in itself no new idea. Indeed, we see it already in nature in the form of the bee-hive, and it is well known by students of nature that it is the most economical structure in material, and it therefore ensures a smaller weight per unit of space than with any other shape. A smaller total weight of the recuperator tends to make regulation quicker and easier, besides saving cost. The tubes are made in various sizes, according to the temperature and coal consumption of the furnace, and a few applications are described later.

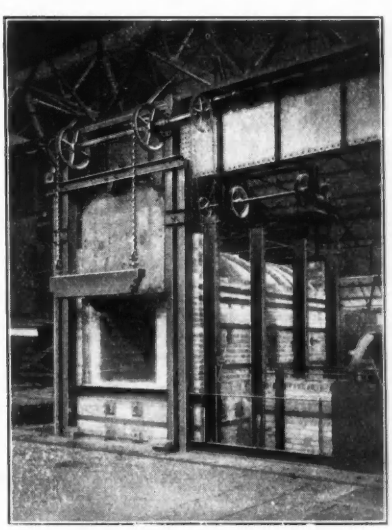
The Lencauchez recuperator has horizontal gas channels and vertical air channels; the Hermansen type, mostly horizontal gas and air channels crosswise arranged, while in the Teisen hexagonal type the gas channels are usually arranged horizontally with vertical zig-zagging air channels, or also



Recuperator with horizontally arranged waste gas and air passages for oil-fired Muffle Furnace.

with horizontal gas channels and horizontal zig-zagging air channels, or, finally, with vertical gas channels and horizontal zig-zagging air channels. The active heating surfaces works out respectively 36 sq. cm. for the Radot-Lencauchez, 20-40 for the Hermansen, and 100 for the Teisen hexagonal type, all per c. dcm. space occupied. The hexagonal type has thus roughly 250-500 per cent. more active heating surface than the other types, and, of course, compared with the various tile types the difference is even more striking.

The increase in economy effected by recuperation is due to various causes: It recovers from the waste gases a certain amount of heat units corresponding to the quantity of secondary air heated and the temperature of same. Secondly, it decreases the amount of excess air and effects a corresponding economy. Thirdly, it raises the flame temperature of combustion and the increased radiation of the hotter flame effects a more efficient and quicker heat transfer with corres-

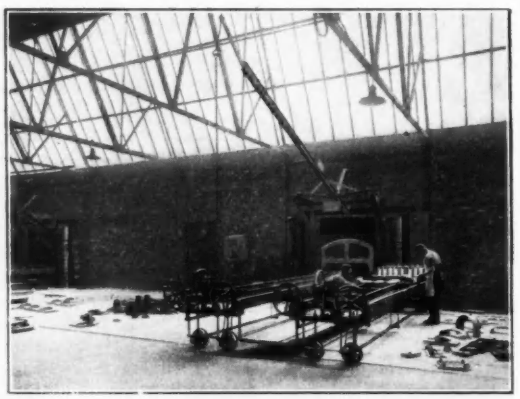


View of large Muffle Furnace for vertically suspended sheet iron, with electrically operated doors open.

ponding increase in economy. The result is that as compared with direct-fired furnaces, for instance, an ordinary coal-fired furnace, a saving in fuel of the order of 30 to 50 per cent. may be obtained. These figures, however, apply only to furnaces having recuperators with the requisite active heating surface and the majority of muffles of various types one comes across are grossly under-recuperated.

Unfortunately, in the case of oil-fired muffles it is difficult to take advantage of full recuperation as the ensuing flame temperature is so extremely high that it calls for the most expensive refractoriness, and even these will be attacked in a much shorter time than in the case of gas-firing unless some dilution of the heat is resorted to. Hence, direct firing or firing with only partial recuperation is mostly used in case of oil-fired muffles, and they are consequently working at a lower thermal efficiency. As the cost of the oil is dearer per B.T.U. the economy is further reduced, and where conditions of space, etc., allow for gas firing it is by far the cheaper of the two for the heating of muffles.

When we come to melting furnaces the aspect is different. Here we can draw full advantage from the intensively hot



Showing front of two "High Power" Wet Process Muffles with "Quickload" medium type Double Charging Machines in front, also registering pyrometer.

oil flame and allow it to develop freely over the material to be melted and impart its heat to same. Also, in the case of smaller muffles, or even single muffles, it is often advantageous to select oil as fuel as the firing is simplified and there are, of course, also other factors, such as conditions of locality and space, which makes it desirable, some times even necessary, to use oil in spite of the other disadvantages mentioned. In that case it is very important to get a furnace of a high standard.

Built-in Gas Producers

If we next consider the various kinds of gas-fired furnaces we find that, apart from a relatively small number fired by town gas or coke-oven gas, or commercial producer gas, such as Mond gas, the majority are producer gas fired either from built-in or central (static) producers. Where the fuel consumption is not too high, and the number of furnaces limited or their location so situated that a central producer plant is not a practical proposition, the built-in producers offers an excellent and efficient means of firing. The main principle to be followed in the design of such producers is to have complete control of the primary air, which is that part of the combustion air which is admitted under the grate. Also, the design of the grate itself should be suitable for the fuel in question. The older types of producers, such as the Siemens, had open grates with a fairly high fuel level, and the height of this, together with the draught at which they worked, regulated the amount of gas produced. A more modern form of built-in producer is the step grate producer with water-cooled fire plates and ash pan.

Pulverised fuel is not applicable to muffle furnaces because of the dust. The mechanical stoker can be used, but the character of heating is mainly that of direct firing, and, as the quantity fired in a muffle is relatively small, say, about 1 ton per 24 hours, it does not offer any real advantages. For oil burners, with full recuperation, it is necessary to select a burner which only uses a fraction of the total air for atomisation, the remaining being supplied hot from the recuperator. The glass industry, for instance, have a number of installations with oil burners of these different types delivering up to 50 gal. per hour each and employing huge recuperators where the air is preheated to as high as 800 to 900° C., and these installations have been very successful because of their high efficiency.

Pitfalls in Furnace Design

Many are the pitfalls in furnace design, and great sums have been wasted by works trying to design their own furnaces. In some cases works appear to have taken this course because of bad experiences with other types, but if the management will really take the trouble of comparing the various furnace types on the market in greater detail, and study the underlying principles as well as real reliable performance figures, they cannot make mistakes.

The box muffle is the standard type used in this country, both for fusing, annealing and scaling operations. In such a furnace the goods are resting on perrits inside the muffle, and heat is transferred to them mainly by radiation. This being the case, the ideal type to comply with physical laws should have the shell heated equally from top, bottom, sides and ends. This is best obtained by passing the burning gases underneath the hearth, and afterwards taking them round the remaining parts in such a manner as to give a slightly progressive temperature towards the door in order to compensate for losses from this unheated end. This principle is in the main followed in a number of designs, but there are others which differ completely, for instance, the overfired type where the gases are lead over the arch first and afterwards under the bottom, or that which is heated by internal combustion chambers arranged in the sides and relying to great extent on convection. Such types can never compare in efficiency with those which are designed more in line with the ideal type outlined above, although, of course, they will give service.

Wrongly Applied Theory

Another example of wrongly applied theory is that of the V-shaped bottom Manyon type, originally introduced from America. By giving the bottom a zig-zag shape and thus increasing the surface compared, for instance, with a flat bottom, a much greater efficiency is claimed. It might serve as a convenient form of landing brick, but, so far as increased efficiency is concerned, that is all wrong. Heat rays, as light rays, follow the sinus law which says that the radiation is at the maximum when taking place at an angle of 90° to the radiating surface and decreasing with the cosines of the angle of deviation down to O when the angle becomes O and the rays are parallel to the heating surface.

The continuous type muffle has made great progress, especially in the States and on the Continent. It is most suited for large works and for a production of uniform character in regard to fusing time.

Dryers can also be designed on the continuous principle, but full advantage cannot be taken of this due to the fact that spraying and dipping is usually suspended during the night. The batch type, therefore, has proved more suitable and the most successful type has been the one where the goods are dried in a chamber dryer carried on small trucks of about a loads capacity. The dryer is heated by streams of hot, clean air heated in an air heater by the waste gases from the furnace. These dryers are most efficient and dry the ware, both sheet and cast iron, in 10 to 20 minutes without any rust formation.

The Royal Society Anniversary Meeting

Sir F. Gowland Hopkins's Address

SIR FREDERICK GOWLAND HOPKINS, O.M., made his final appearance as president of the Royal Society, at the close of his five laborious years of service, on November 30, the name day of the patron Saint of the Society, St. Andrew. He stood, in seeming frailty; yet as a living proof of dauntless courage and of the lengths to which suffering humanity can go in the pursuit of shadows. He is to be congratulated upon his escape. An account of the feasts and functions to which he has been bidden and has religiously attended, at which he has been unheard, would stagger belief. No invitation to assist, whatever the cause, has come amiss to him. He has even filled the office of president of the British Association during his period of Royal elevation. His activity has been beyond belief; his power to transmute calories into every kind of work altogether marvellous. Of course, he has severely neglected his own interests, even of health—physicians don't heal themselves; yet his is not known to have suffered from aluminium, innumerable as have been the dinners—cooked with its aid—he has eaten.

The meeting at first was unusually disturbed—though it never reached the Merry Andrew stage—over the election of officers and council. The rooms in Burlington House were more crowded than those of the Royal Academy next door, at the private view of the Chinese Exhibition, two days earlier—though the antiques were on the floor rather than hung upon the walls or encased. Among the young fellows, even a one-time Middy from the Crimean War was to be seen on the Front Bench. The Lord President of the Council, one of the youngest of the Fellows, was also present—to be only mildly reminded of Seaham. Not even a vocal egg was thrown. The beaming countenance of the assistant secretary gave proof that the officials were delighted to have the meeting raised above the usual level of mere back patting.

Science Hobnobbing with the Church

Science has been said to be hobnobbing with the Church. The question was, in fact, mooted in the room whether the meeting were not one of country parsons at the University, up to vote down some mild measure of advance. It is astonishing what trouble people will take to prevent anything being done; how little to promote even a slight departure from acquired habit; still less aid in perpetrating a joke: for joke the meeting was and a good joke, too, not easily to be forgotten. The dull bones of a too superior body, living in a cloud of aloofness, were definitely rattled. As the "Daily Mail," with characteristic reticence and modesty, has thrust its nose into the Society's affairs, no secret is revealed in calling attention to the proceedings. Press interviews have been reported not only with a leading conspirator but also with a young fledgling secretary. Whether newly elected secretaries should be interviewable, on such occasions, is a point for the law officers to settle. To term a party that has followed strictly constitutional methods a *Rebel Gang* was scarcely tactful, let alone respectful or proper to the office of professor-secretary to the Council. Action was taken because the answer to the memorial submitted to the Council, earlier in the year, was mere official casuistry. The gang met with the fate it expected—rebels rarely do win at the first attempt; few have the courage to risk the odium of being critical. The tiff is quite a friendly one—merely over the question, whether or no the Society shall be organised effectively to serve public needs and, to this end, taken out of the hands of an official caucus and made properly democratic. At present, the Society in no way pulls its weight and is fast losing its importance, in outside opinion.

The president, in his address, subconsciously, if not consciously, followed the line of thought by which the mutineers are guided. He was in large part apologetic for his scientific brethren, who have been roundly accused of overlooking public interests. He went out of his way, in fact, to deal not with the Royal Society but with the British Association, of which, as a holiday exercise, he took charge two years ago. General Smuts, at the centenary meeting of the Association, drew special attention to the fact, long patent to thoughtful observers, that scientific discovery and invention are generally in advance of all ordinary understanding and without influence upon man's ethical development. The present war is sufficient proof. Sir Alfred Ewing, his successor, was of a similar opinion. Sir Gowland Hopkins is less pessimistic, but he does not face the real issue. The primary complaint against the B.A. is, that the pundits will not use a language which either can be or is understood even among themselves: that they have no thought for the public. Further, that the schools are in no way organised to give the desired training. Sir Gowland Hopkins obviously has no clear picture of the situation in his mind and can give no constructive advice.

Research Councils

He is forced to admit that the Society is no longer consulted, as it was formerly. He seeks to explain this as arising from the appointment in recent years of various research councils. The less said of these as effective advisory bodies the better. It matters not what the explanation may be: the fact remains that the forces of the Society are in no way sufficiently organised even to serve its own ends, let alone to render public service. The Council is known to have declined to advise on several recent occasions. Until the body become sufficiently self-conscious of its powers and organised as a scientific House of Peers, no proper consultative use can be made of the scientific ability at our national disposal. Workers must soon demand that this be done.

In the latter part of his address, Sir Gowland Hopkins dealt with what must be to him a far more congenial subject—our nutritional needs. After calling attention, in a cursory survey, to various points of importance, he ended upon the note—"Is the time yet ripe for the initiation of a comprehensive National Food Policy?" He vaguely suggests that it may be. Had he dealt with this subject comprehensively, with the authority his name carries, he would have rendered far greater service; as it is he but sits on the fence.

Still, whatever he may or may not have done as president, the satisfaction must be his, that a great step forward has been taken, even during his period of office. By his elevation to the chair, a party secured recognition: the marriage of chemistry with physiology, long overdue, was at last consummated. With him rests the glory of having struck a spark which has lit the now blazing torch that illumines the study of man's vitality and health. No greater step has been taken in the cause of humanity, in the course of the modern advance of knowledge. As the new president wittily said at the dinner, whilst others have discovered the single factors A, B, C, D, E, he in himself is F.G.H. It is in this capacity that his friends love him.

BARYTES are used exclusively by the large oil companies in Trinidad for drilling operations with rotary tools. Supplies are imported directly by the oil companies for their own use and most of the purchases are made through the head offices of the companies in the United States and elsewhere. Germany is the chief country of origin for the imports, supplying about 80 per cent. of the total, but this year it is reported that important quantities of the pigment are entering from the United States. The imports of barytes into Trinidad during the years 1932, 1933 and 1934 were, respectively, 6,732, 11,305 and 14,255 long tons. In view of the increase in drilling operations it is likely that the imports will expand.

Industrial Disinfectants

A Plea for Standard Testing and Better Classification

RECENT developments in industrial disinfectants, mainly from the point of view of their manufacture and testing, were the subject of a paper which Mr. J. Gibson read at a meeting of the London Section of the Society of Chemical Industry on December 2, when Dr. H. E. Cox (chairman of the Section) presided.

Mr. Gibson dealt largely with the industrial disinfectants used for large-scale disinfection, rather than the specialised germicides. The desirable properties of the ideal fluid disinfectant he summarised as: (1) high germicidal activity; (2) stability and homogeneity on storage; (3) coefficient (germicidal activity) maintained under practical conditions of use, especially in contact with various forms of organic matter; (4) stability and coefficient maintained when diluted with hard, brackish or sea water, or with soap solution; (5) non-poisonous; (6) agreeable smell; (7) non-caustic; (8) without action on metals and textiles.

Mercury Salts

Discussing some of the disinfectants from the point of view of this ideal specification, he said that mercuric chloride had a comparatively modest coefficient and was extremely poisonous. Mercury salts were rapidly put out of action by many forms of organic matter, they were precipitated by albumin, soap, etc., and in these respects failed badly when compared with his specification; indeed, mercuric salts had nothing to recommend them. Hypochlorite solutions had fairly good coefficients, but in the presence of even small quantities of organic matter they lost their germicidal efficiency very rapidly. They deteriorated on storage, could not be stored in metal containers, and had a bleaching action on coloured textiles. However, hypochlorites were almost ideal for certain purposes. They were most efficient for the disinfection of swimming bath water, and the fact that there was no objectionable smell or taste after their use rendered them particularly valuable for sterilising plant in food factories, etc.; but in both cases the amount of organic matter present was negligible.

Discussing a table showing the effect of organic matter on the coefficients of disinfectants, Mr. Gibson pointed to the very rapid fall in the coefficient of hypochlorite solutions in the presence of even small quantities of organic matter. Coal tar fluids were not affected to anything like the same extent. Potassium permanganate, despite a high initial coefficient, also compared unfavourably with the coal tar fluids. Formalin in solution had little claim to the title disinfectant, although it was claimed to have considerable efficacy in the gaseous form.

Coal Tar Disinfectants

The coal tar disinfectants were a class of products which, although having the common characteristic of being made from derivatives of coal tar, varied greatly amongst themselves both as regards their composition and their properties. The active ingredients were the phenols—carbolic acid and its higher homologues. Apart from carbolic acid itself (which was seldom present in disinfectants), the phenols were practically insoluble in water, and emulsifiers were therefore used to make them soluble or miscible. It was possible to make coal tar fluid to comply with any one (or even several) of the points of his specification, but, unfortunately, no one type of fluid satisfied all the points. The coal tar fluids could be classified into the two main groups of black and white fluids. A black fluid was made from creosote oil and phenols, emulsified with soap; on pouring it into water it formed a white emulsion. The white fluid was made from the same coal tar raw materials, *i.e.*, creosote oil, cresylic acid and high boiling acid, but a different type of emulsifier was used, usually glue or gelatin, casein or dextrin, and smaller proportions of other substances might be added with the object of lowering surface tension and increasing the stability of the fluid and its emulsions in water.

Mr. Gibson reviewed briefly the problems of the manufacture of the various types of coal tar disinfectants. In the course of some comparisons of the black and white coal tar fluids, he pointed out that disinfection was frequently carried out in conjunction with cleansing operations, and it was therefore important that disinfectants should retain their germicidal activity in the presence of soap solutions. White and black fluids appeared equally compatible with soap solutions, but he gave some figures on the effect of soap solutions on the coefficients of the fluids, showing a marked difference in their germicidal activity under these conditions, the black being superior to the white. Coal tar fluids could not claim to be non-poisonous in themselves, but when diluted for use they were quite harmless. Compared with Lysol, both black and white fluids were practically non-caustic. They were without action on metals and textiles, and the danger of staining the latter was very slight at the dilutions usually employed.

The Rideal-Walker Test

Disinfectants were invariably evaluated bacteriologically. The most generally used test was the Rideal-Walker test, introduced in 1903 by Dr. Samuel Rideal and Mr. Ainslie Walker, and recently standardised and published by the British Standards Institution. Mr. Gibson discussed this and other standard tests, most of which employed *B. typhosus* as the test organism. It was manifestly impossible, he said, to devise any single test which would give an indication of the behaviour of a disinfectant in all the possible conditions under which it was to be used. Why not, then, adopt the Rideal-Walker test, admittedly carried out under the most favourable conditions, and divide the effective dilution indicated under those conditions by an agreed figure? This was just as likely to give a satisfactory indication of the requisite dilution for actual disinfection as any other single test however elaborate. If such a scheme were adopted disinfectants would require to be divided into various classes according to their chemical properties.

Standard Tests and Conditions of Use

Finally, Mr. Gibson urged that if the main users of disinfectants could get together and thrash out the conditions of test which would typify the principal uses of disinfectants, it should be possible (in collaboration with the manufacturers) to work out a standard test, with suitable modifications to simulate the different conditions under which the disinfectants were likely to be used. Manufacturers might also be willing to standardise, or at least classify, their disinfectants for certain uses. One trouble was that certain classes of disinfectants, eminently suitable for one kind of disinfection, were sometimes recommended for others for which they were entirely unsuitable.

Varnishes and Enamels in Czechoslovakia

VARNISHES and enamels were not manufactured in that part of the old Austro-Hungarian monarchy which now constitutes Czechoslovakia. Since the creation of the new state, the domestic paint and varnish industry has developed rapidly. About 50 firms are manufacturing paint products, and 12 large firms are reported to manufacture about 80 per cent. of the total annual output, with 2,000 tons of varnishes and 1,500 tons of enamels. A complete line of spirit varnishes is manufactured, which is extensively used by the furniture and toy industries.

Annual Ramsay Chemical Dinner

Chemistry's Contribution to Civilisation

THE thirteenth annual Ramsay Chemical Dinner was held at the Central Station, Glasgow, on December 6. This dinner is held under the joint auspices of all the chemical and allied societies in Glasgow and district in conjunction with the Chemical Society. It has as its object the commemoration of Sir William Ramsay. The principal guest on this occasion was Sir Thomas Holland, Principal of Edinburgh University.

Sir THOMAS HOLLAND proposed the toast of the profession of chemistry. Problems which had been baffling the geologists for some time, he said, were really problems for the chemists. Chemists said that geology was not a science as they defined a science, it was but a summation and abstract of all sciences. It was, in fact, what might be called a synthetic science. Chemists were accustomed to quick reactions taking place on a small scale and ranging in speed from an explosion to slow combustion. The geologist dealt with chemical work in nature proceeding throughout geological ages. The chemist was impatient of these reactions but would do well to leap over the garden wall and take an interest in the work of his neighbour. He put forward two specific problems which were worrying geologists. The first was connected with physical change and particularly with thermal change, a subject in which Ramsay had established a wide reputation before he discovered the inert gases. In Sir Thomas's younger days geologists failed to realise the value of precise chemical analysis. They were content to know the principal constituents of a mineral and based their classifications on these principal constituents. Some analysis gave a knowledge of the smaller constituents and these, in some cases, had proved to be the most important.

Laws Controlling Natural Deposits

With the growth of civilisation there had arisen the desire for the use of metals. This desire had increased and would continue to increase until the supply became exhausted and then civilisation, as we knew it, would come to an end. He wanted his hearers to be interested in the laws—if they could find them—which controlled natural deposits. Nature was not the perfect and never wasteful goddess poets would have us believe. But then, asked Sir Thomas, what did one expect of Nature. Reactions had gone on for countless ages and had produced local concentrations of minerals. To determine the laws which had been operative in the formation of the concentrations the geologist wanted the help of the chemist. In conclusion, Sir Thomas asked if crystallisation was an exothermic change. He said that crystals were formed from amorphous bodies by condensation and rearrangement of the molecules, and he suggested that the tendency towards crystallisation was parallel to chemical affinity. He wanted, however, to stir up chemists and make them eager to tackle problems outside their own interests.

Dr. J. F. TOCHER replied, and said he had consulted Sir William Ramsay in 1891 and he still felt a sense of gratitude for the consideration he had shown to a quite unknown young man. Chemistry was the mother of sciences and had given to the world a knowledge of the structure and nature of matter. Chemical discoveries were followed by mass production of new substances, some of which had proved destructive to human life. It was not the job of the chemist to fight but to unravel mysteries for the physicist, geologist and physiologist. There was a limit, however, to what chemistry could do. An abundance of food had been directly produced, but brains could not be directly produced. Problems in nutrition were not problems for chemists. A great deal of ill health was due to malnutrition which could and would be removed. In conclusion, Dr. Tocher said that not only was food and education necessary for the improvement of mankind but also a knowledge of heredity. In his opinion the English-speaking nations had cast off more of the worn-out garments of tradition than any of the others.

Brig.-Gen. J. W. WALKER proposed the toast of "Our Guests," and said it was fitting that the reply was in the hands of the distinguished European scientist, Professor Paneth, whose work has been associated with helium and the radio active elements with which the name of Sir William Ramsay would always be associated. Among the other distinguished guests mentioned by Brig.-Gen. Walker were Professor N. V. Sidgwick, president of the Chemical Society, Mr. W. A. S. Calder, president of the Society of Chemical Industry, and Sir D. M. Stevenson, Chancellor of Glasgow University.

Professor F. A. PANETH, in reply, said it was an honour to be allowed to return his sincere thanks for an interesting evening. As a stranger he could appreciate the value of hospitality. At an early age he had been interested in the work and personality of Sir William Ramsay. In 1908, Sir William, then president of the Chemical Society, had delivered a lecture in Germany and Professor Paneth said that he still had the notes in which he tried to fix the words of Sir William. He did not then understand all he heard, but it had been an inspiring talk to a young man. He was then in the Institute for Radium Research where he was the only chemist. As he had only a small amount of radium emanation to deal with and as the possibility of getting instruction in gas analysis in Austria or Germany was small, he decided to go to the land where gas analysis was a fine art. He went to Glasgow and spent a profitable summer term receiving instruction from Professor Soddy. Since then he had come to Britain frequently and had been a delegate from Konigsberg University at the Faraday celebrations in 1931.

Mr. H. C. MOIR proposed the toast of the chairman and said that Sir Thomas had had five meetings in London on Thursday and yet he had done them the honour of attending the dinner and had worthily sustained the tradition of the many distinguished people who had preceded him.

Sir THOMAS HOLLAND, in his reply, said that though Glasgow had nurtured Ramsay in his early days they had failed to hold him, and he often wondered if to-day there might not be some young Ramsays going unnoticed.

The Wonders of Tinplate

A New Trade Film from France

UNDER the auspices of the International Tin Research and Development Council, large audiences comprising representatives of Government departments, trade organisations and numerous tinplate using industries witnessed at the Polytechnic Extension, Great Portland Street, London, on Monday, the presentation of a new film dealing with tinplate and canning which had been produced in France under the title "Magie du Fer-Blanc" by the Technical Office for Steel Utilisation. The film was shown in London with the object of stimulating interest in films as a medium for spreading information about canning. Sir John Campbell, chairman of the International Tin Committee, welcomed the guests, and introduced M. Peissi, director of the Technical Office for Steel Utilisation.

The film depicted every phase of the processes by which tin and steel are made into tinplate and formed into the cans, which were shown being filled with various foods, processed and sealed for distribution to the ends of the earth, so that their contents might be made available when and where required. The cinematograph reproduction of the reflections and shadows of tinplate was extremely realistic and the rapidity and the ingenuity of the manufacturing operations on the material could be clearly appreciated.

Hydrogen Production by the Badische Process—IV

Removal of Carbon Dioxide and Sulphur

In continuation of notes on the Economics of the Synthetic Manufacture of Ammonia, published in "The Chemical Age," October 5 to November 16 inclusive, the present series deal particularly with the design of the plant for the production of hydrogen by the Badische Process.

THE CO_2 will be scrubbed out by washing with water under pressure. The volume of water required is large as the solubility is small. The pressure also has to be considerable to increase the partial pressure of the CO_2 to such extent, that the quantity of CO_2 that the water can take up may be sufficient for practical purposes.

The *position* of this section of the plant is a matter for consideration. It is a question of the effect of the CO_2 on the efficiency of the fractional combustion for the removal of the CO. If its presence is not seriously detrimental to the complete removal of CO, then it might be well to wash out the CO_2 *after* the fractional combustion, thereby making a saving on the lime, which would have to be employed in larger quantity for the removal of the last percentage of the CO_2, if the washing was carried out before the fractional combustion. For the present, it will be safer to assume that the removal of the CO_2 should take place *before* the fractional combustion.

Quantity of CO_2 to be Removed.

In the scrubbing of the catalysed water gas, a small quantity of CO_2 will have been removed. The composition of the gas going to those scrubbers was about :—

300 − 39 =	261 vols.	steam	65.4%
48 + 39 =	87 vols.	Hydrogen	21.6%
42 − 39 =	3 vols.	CO	0.75%
5 + 39 =	44 vols.	CO_2	11.0%
5 =	5 vols.	N_2	1.25%
	400 vols.		

so that the partial pressure of the CO_2 varies between

$$\frac{11 \times 15.7}{100} = 1.73 \text{ lb. and } \frac{31.5 \times 15.7}{100} = 4.95 \text{ lb.,}$$

the gas being at (say) 1 lb. plus pressure.

The condensation of the water will be almost instantaneous, so that the partial pressure will be nearer 4.95 lb. The solubility of CO_2 being at 30° C. (average temperature of water) 0.66, the number of cu. ft. of CO_2 at 0° C. and normal pressure removed by 1 cu. ft. of water at 30° C. would be :—

$$\frac{0.66 \times 4.95}{14.7} \div 0.22 \text{ cu. ft.}$$

Therefore, 1,900 gal. would remove

$$\frac{1{,}900 \times 0.22}{6.25} = 66.9 \text{ cu. ft./min.}$$

$$= 71.8 \text{ cu. ft. per minute at } 20° \text{ C.}$$

The volume of catalysed gas is about 12,300 cu. ft. at normal pressure, and, as the percentage of CO_2 is 31.5, the volume is 3,870 cu. ft. Therefore,

$$\frac{71.8}{3{,}870} = 2.3\% \text{ of the } CO_2 \text{ is removed in this washing.}$$

The other gases will be removed to the extent of about

$$\frac{0.015 \times 9.75}{14.7} = 0.01 \text{ cu. ft. per cu. ft. of water,}$$

$$= \frac{1{,}900 \times .01}{6.25} = 3.04 \text{ ft. per min.,}$$

which is negligible.

Thus the composition of the gas will be (assuming 2 per cent. removal of CO_2),

10,256,000		Hydrogen	61.5%
393,000		CO	2.36%
5,057,000*		CO_2	31%
590,000		N_2, etc.	3.53%
16,296,000 cu. ft. per 24 hours ÷ 11,300 cu. ft. per minute at 20° C. (at normal pressure).			

* 5,160,000 − 103,000 = 5,057,000 cu. ft.

The quantity of CO_2 to remove = 3,500 cu. ft. per minute, or, if 1 per cent. of the CO_2 remains after the washing under pressure, 3,150 cu. ft. per minute.

Removal of Sulphur Compounds.

The catalysers will have converted all (or practically all) CS_2, etc., into H_2S, so that all the sulphur can be removed as such at this stage.

As will be shown, the pressure water washings would remove nearly the whole of the H_2S, but the CO_2 obtained would be contaminated with about 1 per cent. of H_2S, and it is a question whether this is desirable, if some of the CO_2 is afterwards used for neutralisation with ammonia. Further, the installation of oxide boxes ought to partly pay for themselves; the recovery of sulphur, if economically worked with a gas rich in sulphur, being an asset rather than otherwise.

Oxide boxes would anyhow have to be installed after the water washing, as a final safeguard, and, although these might be of much smaller capacity, yet if they are to be installed at all, they might as well be used to recover the whole of the sulphur and prevent contamination of the CO_2. So it is suggested that the gas should pass through iron oxide boxes on the way to the compressors.

If the water washing was placed after the fractional combustion, these boxes would anyhow be required, as the fractional combustion catalyst will not work in presence of sulphur.

The gas leaving the scrubbers after the converters would pass direct to the iron oxide boxes, and from thence to the storage gasometers holding purified catalysed water gas. (The pressure of the gas entering the gasometers would be about 8 in. water.)

Size of Iron Box Installation.

Volume of gas (max.) to be dealt with = 16,300,000 cu. ft. per 24 hours.

Sulphur content (max.) (say) 200 grains per 100 cu. ft. (0.34 per cent. H_2S).

The quantity is not likely to be more, considering that the gas will have passed through two water scrubbings (at ordinary pressure). In the original water gas, it is likely there would be about 200 grains per 100 cu. ft., therefore, the sulphur content of the catalysed water gas would usually be *less* than :—

$$\frac{200 \times 11.8}{16.3} = 145 \text{ grains per 100 cu. ft.}$$

$$\frac{145}{7{,}000} = 0.0207 \text{ lb. S} = 0.022 \text{ lb. } H_2S \text{ per 100 cu. ft.}$$

$$= \frac{0.022}{34} \times 385 = 0.25 \ H_2S.$$

The plant for the improved system of (Lane) hydrogen manufacture included water gas purifiers for 12½ million cu. ft. per day of gas containing 0.5 per cent. H_2S = 300 grms. per 100 cu. ft. The number of boxes advised for this quantity of gas was 16, 45 ft. × 40 ft. × 6 ft. deep, arranged in four sections, each section containing four purifiers, arranged in line in one box. Two tiers of wood grids 5 ft. × 2 ft. with taper sides and hardwood sides, supported on two tiers on bearing bars, are situated inside to carry the oxide.

Total area = 1,800 × 16 = 28,800 sq. ft. for 12.2 million cu. ft. per 24 hours, therefore, for 1,000 cu. ft. per 24 hours = 2.3 sq. ft.

On the same basis, 20 such boxes instead of 16 would be required to purify the water gas, but, as the percentage of

sulphur is only one half, the 16 boxes would probably suffice, provided room was allowed for extension if necessary.

The *quantity of sulphur* recovered per day would be

$$(16{,}300{,}000)\ .0025 = 40{,}700 \text{ cu. ft. } H_2S,$$

$$= \frac{40{,}700 \times 34}{385} = 3{,}600 \text{ lb.} = 1.6 \text{ tons.}$$

$$= 560 \text{ tons per annum.}$$

$$= \text{(about) } 1{,}000 \text{ tons of spent oxide.}$$

Cost of Removal of Sulphur.

Assuming a cost of 1s. per unit and 50 per cent. oxide, this is

1,000 × £2 10s. =	£2,500
Less oxide, 1,000 × 17s. =	850
	£1,650 per annum.

5 per cent. on capital cost of plant is £3,000.

It is not likely the installation would pay for itself; but for the certainty of obtaining a pure gas it is a necessary part of the installation.

Removal of CO_2 Compression.

The gas has to be compressed, passed through scrubbers under high pressure, allowed to expand and then stored in a gasometer. In the scrubbers it will meet with water pumped in under pressure. The water pressure will afterwards be used to regain some of the power of compression and the CO_2 would be removed from its solution in the water on release of the pressure.

Volume of gas to be compressed per minute = 11,300 cu. ft. per minute at 20° C. and normal pressure.

$$\textit{Diameter of feed main} = \sqrt{\frac{11{,}300}{60 \times 60 \times 0.786}} = \sqrt{4.0}$$

= 24 in.

The pressure to which the gas should be compressed for best efficiency can only be obtained after consideration of the power required, etc., under different conditions and the following notes will be of use for the purpose of deciding this point:—

Solubility of CO_2 in Water.

The solubility of CO_2 in water is given as follows:—

0.665 at 30° C.	1.194 at 10° C.
0.878 at 20° C.	1.724 at 5° C.
1.019 at 15° C.	1.713 at 0° C.

This is the Bunsen coefficient, *i.e.*, volume of gas @ 0°C. and 760 m/ms.* absorbed by unit volume of the liquid. This absorption coefficient therefore refers to one atmosphere partial pressure of the CO_2. According to Henry's law, the absorption should increase directly as the pressure increases.

Wroblewski made the following measurements at 12.4° C., with which are compared the absorption coefficients according to Henry's Law:—

Pressure atm.	Absorption Coefficient (Wroblewski)	Calculated from above.
1	1.086	1.10
5	5.15	5.50
10	9.65	11.00

i.e., 11.1 per cent. less than theory is absorbed at 10 atm. and 5.1 per cent. less than theory is absorbed at 5 atm.

It is important that the water should be fairly pure, otherwise there will be a considerable decrease in solubility; thus 1 vol. NaCl 7 per cent. solution dissolves 0.735 vols. of CO_2, instead of 1.019 vols. in pure water at 15° C. Owing to electrolytic action, also, unless the water is fairly free from magnesium, calcium salts, there would be greater tendency for the CO_2 solutions to corrode the steel vessels in which the washing is carried out.

At ordinary pressures, Henry's law is found to hold such that $x = a\frac{P}{760}$.

Nacceri (1880) shows departure from Henry's law of CO_2 is not as great as Khamikoff; and Luginin's experiments indicate at ordinary pressures a/p increased about 10 per cent. for four atmospheres increase.

Just ("Zeit. Phy. Chem.," 1901, *37*, 342): CO_2 absorbed about seven times as strongly by acetic acid, acetone or methyl acetate as by water. The *solubility of CO_2* in 44 solvents, among which the following measurements at 25° C. are noted:—

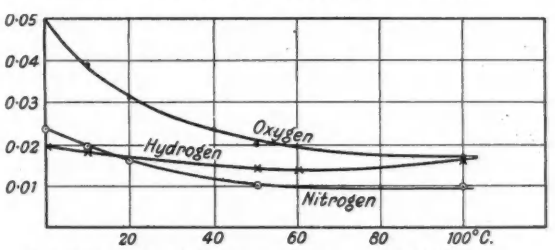
In Glycerine i_{25}	= 0.0302
,, Water	= 0.8256
,, Aniline	= 1.324
,, Isobutyl alcohol	= 1.849
,, Benzol	= 2.425
,, Ethyl alcohol (97%)	= 2.706
,, Methyl alcohol	= 3.837
,, Chloroform	= 3.430
,, Pyridine	= 3.656
,, Acetic acid	= 4.679
,, Acetone	= 6.295
,, Methyl acetate	= 0.494

$$i = \frac{\text{Cfl.}}{\text{Cg}} \qquad \text{Cfl} = \frac{\text{mols. gas in liquid.}}{\text{vol. of liquid.}}$$

The simpler acetates, alcohols, etc., dissolves the most.

	Solubility H_2	N_2	CO
Glycerine	..(Unmeasurable)	(unmeasurable)	
Water	.. i_{25} = 0.01992	0.01634	0.02404
Aniline	= 0.02849	.03074	0.05358
Acetic acid	= 0.06330	.01190	0.1714
Benzol	= 0.07560	.01159	0.1707
Acetone	= 0.07641	0.1460	0.2225
Toluol	= 0.08742	0.123	0.1808
Ethyl alcohol	= 0.08742	0.1432	0.1921
Methyl alcohol	= 0.09449	0.1415	0.1955

Slow action with CCl_4 and $CHCl_3$ no constant result.



Solubility of Hydrogen, Oxygen and Nitrogen at 1 atm. pressure.

Ratio of solubilities of CO_2 and H_2 41.51 in water, 82.38 in acetone, and 73.92 in acetic acid. *CO, H_2, N_2 increase solubility* with temperature except in water and aniline. *With CO_2*, solubility decreases with temperature in all cases.

Henry's original paper in the "Phil. Trans.," 1803, shows that his values are in close agreement with the accurate values of Bohr; his law was based on observations up to 3 atm. pressure. There appears to have been no work published on the solubilities of gases at high pressures (except up to 10 atm. in the case of CO_2).

* Vapour pressure of water not included.

Iron and Steel Institute

Andrew Carnegie Research Fund

THE Council of the Iron and Steel Institute makes annually a limited number of grants from the research fund founded by the late Mr. Andrew Carnegie in aid of metallurgical research work. The object of the scheme is not to facilitate ordinary collegiate studies, but to enable students, who have passed through a college curriculum or have been trained in industrial establishments, to conduct researches on problems of practical and scientific importance relating to the metallurgy of iron and steel and allied subjects. Candidates, who must be under 35 years of age, must apply before January 10, 1936, on a special form to be obtained from the Institute.

The value of the grant will depend on the nature of the proposed research work, but the maximum granted in any one year will, as a rule, not exceed £100. The Council may award a further grant in aid of any particular research work which seems sufficiently meritorious to justify further assistance. The results of the research are to be communicated to the Iron and Steel Institute, which will have the right of priority of publication in full.

Modern Glass Making Practice

Society of Glass Technology Holds a General Discussion

OPENING a general discussion on glass melting furnaces at a meeting of the Society of Glass Technology at Leeds on November 20, Mr. W. Maskill, B.Sc., A.R.C.S., Ph.D., dealt with "The Control of Glass Melting Furnaces." He pointed out that the design of furnace flues in general left much to be desired. Normally they were oversized rather than undersized, rendering scientific control measurements very difficult. Valves, constrictions or bends effectively destroyed the out-size nature of flues.

Regenerative preheating was considered in detail, and compared with recuperative practice. It was often considered that regenerators were generally too small. Infiltration of air through the brickwork of out-going flues and regenerators sometimes amounted to as much as 40 per cent. of the total waste gases, and the temperature of such gases did not truly indicate the temperature of the waste gases leaving the furnace. The control of the direction of gas-flow through regenerators was discussed. An arrangement such as a baffle wall to produce a horizontal flow also provided a dust trap.

Heat Transference

Linked closely with the question of port design was that of the more satisfactory form of heat transference to the glass, by radiation or by convection. For optimum operating conditions, coupled with facility of control in a tank furnace, a system with gases flowing at high velocity burning with a short flame, and depending upon convection for heat transference, should be employed. It was explained that the calculation of stacks should be based on the velocity of efflux. The effective height could be increased by insulating the stack along part of its height.

The difficulties attendant upon accurate temperature measurement were considered, and in addition, the danger of wrong interpretations when the measurements were made under different furnace conditions. The combustion chamber and the waste gas streams were points of importance and, when producer gas was used, the temperature of the gas leaving the producer was important. Measurements of gas volume were preferred to those of gas pressure in checking the balance and operation of a system, and methods of measurement were outlined. The importance of the analysis of fuel gas and waste gas was also stressed. When stable conditions had been established, the installation of a carbon-dioxide recorder could fulfil all the needs for control. Allowance should be made for the carbon dioxide liberated from the batch.

Surface Temperatures

In a subsequent paper entitled "A Survey of Surface Temperatures of a Glass Tank Melting Furnace," Mr. H. S. Y. Gill, B.Sc.Tech., and Mr. N. A. Nichols, B.Sc.Tech., reported some data obtained from a two-port cross-flame producer gas-fired tank of dead weight capacity of 50-55 tons, delivering about 55 tons of colourless glass per week. They stated that cooling air was applied to the fireclay blocks at the flux line and several other positions, including the throat, and the temperatures of selected portions on the outside of the blocks, were measured by a standard Cambridge contact pyrometer. After four months insulation was gradually applied to the crown of the melting end, covering it completely after nine months.

In every case there was a rise in temperature of the block surfaces at the middle and at the flux line as time progressed, the rate of rise being greater at the flux line than lower down. During the complete run the rise in temperature at the flux line was 150-250° C., whilst at other points it amounted to 40°-100°. The temperature of the walls of the working end, and of the bottom, remained steady. Before insulation, the average temperature of the silica brick surface of the crown was 230°, but after applying a 3-in. insulating layer the face between the silica and insulation was 890°.

The conclusions drawn from this investigation were that the temperature of the outer surface of the furnace was affected to some extent by small variations of internal conditions, the crown being the most susceptible area on account of its lower heat capacity and the greater thermal conductivity, until insulation was applied; the material in contact with the outer surface was the main controlling factor of surface temperature, the insulation on the crown, the cooling air, and the normal air exerting the greatest influence; corrosion of the side walls over a period of several months resulted in an increase in the surface temperatures, in spite of cooling air, this effect being most marked at the flux line; and the external temperature of the blocks, as indicated by the surface pyrometer, was a guide to the corrosion of the walls, bridge, etc., indicating where extra cooling was necessary to prolong the life of the tank.

Distribution of Heat Losses

A third paper, by Mr. H. S. Y. Gill, B.Sc.Tech., dealt with "The Distribution of Heat Losses in a Tank Furnace System." After reviewing the factors necessary to estimate the heat balance of a tank furnace system, the author briefly summarised the main features of the particular furnace which he had investigated. This furnace was the 50-ton glass tank furnace, regeneratively fired with producer gas, which had been fully described in the preceding paper by Mr. Gill and Mr. Nichols. Calculations were made of the total heat available from the gasified fuel: of the heat needed in glass melting; and of the heat losses, including losses from the structure by radiation and convection, losses by conduction through the walls, heat carried away by the cooling air and water, and the heat content of the gases in the system.

Expressed as percentages of the heat content of the coal the main losses proved to be 22.3 in the producer and flue to the gas valve; 37.2 from the furnace structure; 7 from the regenerators; and 25 as stack loss, of which 2.5 was contributed by the excess air used for combustion. The efficiency of the furnace was 7.3 per cent., and the efficiency of the regeneration was 53 per cent. Insulation cut down the loss at the crown from 6 to 3 per cent.

Use of Producer Gas

"Producer Gas Plant in Glass Manufacture" was the subject of a fourth paper by Mr. F. J. Hurlbut, M.A., who indicated points which called for special attention when laying down plant for the production of raw gas for glass melting. He considered it advisable to plan the capacity of the producers so that the gasification rates were moderate, the reasons for this being outlined. The choice of blower, whether an electric fan or turbo-blower driven by steam, was carefully considered, and comparison was made of the total cost of steam supply by these two means.

Turning to criteria given for choosing and working a bituminous gas producer coal, the author stated that the proximate analysis and the fusion point of the ash under reducing conditions were usually considered, but he had experienced anomalous results when using such tests. Particulars were given of the behaviour under test, and in practice, of two coals, one from the St. Helens district, the other from Yorkshire. It was obvious that the simple tests quoted were inadequate for choosing a coal for a producer with mechanical agitation, and it was suggested that the chemical compositions of the refractory lining and the coal ash might have some bearing on the problem. A further point discussed was the hardness of the coal, a friable variety producing an undesirable proportion of "fines."

Notes and Reports from the Societies

Chemical Society

Alkaloids : General Ideas and Methods

A GENERAL lecture on the subject of alkaloids was delivered by Professor G. Barger, in the Chemical Department of the University of Birmingham on December 3, under the joint auspices of the Chemical Society and the University Departmental Chemical Society, Professor W. N. Haworth being in the chair.

After discussing the various definitions which have at times been given for the term " alkaloids " and the ideas of biologists regarding their significance, Professor Barger stated that there was now almost unanimity of opinion that the alkaloids are waste products of protein metabolism. Hence he attempted to trace their origin from the known amino acids of protein. This origin is clearest in the case of those alkaloids which contain a benzene nucleus derived from tyrosine or tryptophane. By decarboxylation of tyrosine, methylation and introduction of additional hydroxyl groups in positions 3 and 5 of the benzene ring, simple amines are formed, such as hordenine of barley, which also occurs with a number of similar substances in the cactaceæ. By condensation with an aldehyde (formaldehyde, acetaldehyde or more frequently a phenylacetaldehyde itself derived from tyrosine) ring closure takes place and numerous isoquinoline alkaloids are formed, chiefly limited to the botanical cohort Ranales (Ranunculuceæ, Berberidaceæ, Papaueraceæ, Fumariaceæ, Lauraceæ, etc.). Some 60 of these alkaloids are known which contain hydroxy-, methoxy-, or methylene dioxy groups in positions 3, 4 or 5. The additional groups are thus ortho to the preformed hydroxyl of tyrosine, never in the meta position.

Derivatives of Resorcinol

Derivatives of resorcinol and phloroglucinol do not seem to occur among the alkaloids but more commonly among the tannins, flavones, etc., where the relative benzene ring seems to be derived, not from an aromatic amino acid but direct from sugar. The simple benzoyl isoquinoline type, typified by papaverine and laudanosine, gives rise to a number of other types. By loss of two hydrogens a second ring closure occurs and the aporphine type arises, so called after apomorphine. Morphine itself is peculiar in having one hydrogenated benzene ring. By means of an additional carbon atom (from formaldehyde) a different ring closure produces the berberine type, and with a second additional carbon atom the closely related corydaline type. In these the nitrogen atom is joined to three separate carbon atoms, and by the breaking of the bond between it and one of these atoms three new types arise : (1) Protopine and cryptopine with a ten-membered heterocyclic ring ; (2) hydrastine and narcotine with a lactone group ; (3) Chelidonine and related alkaloids.

In the elucidation of the structure of harman, an oxidation product of tryptophane and a degradation product of the harmala and other alkaloids, Robinson showed that a similar ring closure with an aldehyde also explains the origin of a large number of alkaloids derived from indole. The aldehyde which effects this ring closure may be itself of complicated nature, *e.g.*, formylanthranilic acid (doubtless derived from the breakdown of an indole nucleus), which builds up the alkaloid rutaecarpine. Professor Barger illustrated some of these considerations and certain general methods of degradation and synthesis by reference to recent work in his own laboratory on laurotetanine, boldine, pukateine, laureline, yohimbine, etc.

The origin of the quinoline as distinct from the isoquinoline nucleus presents some difficulties and may possibly be explained by the breakdown of the indole nucleus of tryptophane to ortho-amino-benzaldehyde, from which, under " biological " conditions, a quinoline nucleus has been shown to arise.

Society of Chemical Industry

Leeds Section : Synthetic Rubber

THE comparative values of synthetic and natural rubber were discussed by Dr. W. J. S. Naunton in a lecture given at the University of Leeds, on December 9. He showed how, owing to great developments in the art and science of rubber growing, it was hopeless for the present synthetic products to complete at an economic price. The future of synthetic rubber lay in the production of a better product at an advantageous price. Abnormal economic conditions in Russia and, to a lesser extent, in Germany, had made it possible for synthetic rubber to be developed on a scale large enough to permit of reduced costs and improved production methods and, as a result, its future was never brighter than it is to-day. While a synthetic rubber which gave better resistance to oil than the natural product would replace it in many specialised applications, a synthetic rubber which offered better resistance to abrasions would ultimately replace the natural product in its most important field—tyre manufacture. Such synthetic products were definitely known.

After dealing with the economic aspect of the problem, Dr. Naunton considered the theoretical side and pointed out that recent progress had been largely due to the recognition of the predominant importance of the colloidal or physico-chemical aspect as distinguished from the purely chemical side of the problem. The early work attached too much importance to slavishly following the composition of rubber and hence producing pure butadiene hydrocarbons by beautiful academic multi-stage syntheses. Modern technique produced its hydrocarbons by comparatively crude methods but attached the greatest importance to methods of polymerisation. With regard to purity it was ironical to note that the best synthetic rubbers had been made by deliberately introducing impurities into the polymerisation mixture.

It was now recognised that rubbery properties were not the undisputed possession of the butadiene hydrocarbons. The characteristic properties of rubber were not inherent in its chemical but in its physical backbone. If it was possible to reproduce this structure a " synthetic rubber " would be produced. Carbon atoms might be replaced by nitrogen or phosphorus, or be even entirely absent, but yet a " synthetic rubber " was produced when one succeeded in arranging the atoms in the necessary way. Duprene contained chlorine, but yet in many respects was more rubbery than rubber itself. Perhaps even a better example was the progress made in connection with the " synthetic rubbers " from halogenated ethylene derivatives and alkali polysulphides. The brilliant work of Patrick and Katz had resulted in the complete understanding of these products and in the development of new products with remarkably rubber-like properties.

Liverpool Section : Adsorption and Catalysis

PRESIDING at a meeting of the Liverpool Section of the Society of Chemical Industry on December 6, Professor C. O. Bannister intimated that Lord Leverhulme had consented to act as chairman of the Reception Committee when the Society holds its annual meeting in Liverpool in July, 1936.

Introducing the subject of his paper on " Adsorption and Catalysis," Professor E. C. C. Baly said that although a large amount of work had been done nothing was known of the action that occurred in the substance during the adsorption process. One could not possibly examine the substance when it was adsorbed. So it seemed at the start that they would have to look for a substance which was completely stable for a long time and capable of examination at leisure. It was found some time ago that kieselguhr had the power of adsorbing a large amount of materials such as alumina, copper and cobalt. In the last year or so they had made an extensive study of the system with some very interesting re-

sults. The type of kieselguhr they used was known as "super floss."

Professor Baly continued by describing under what conditions the properties of adsorbed substances may be examined, dealing in particular with kieselguhr coated with an adsorbed layer of alumina. After outlining the method used for pretreatment of the kieselguhr and the method used for the deposition of the layer, he said that an investigation of this adsorbed layer had been made by a determination of the relation between the amount of alumina adsorbed and the surface potential. The surface potential was enhanced with a certain amount of alumina at a point corresponding with a uni-molecular layer by comparison with the surface area of kieselguhr as determined by water adsorption. The stability of the system indicated the existence of an activated adsorption complex in which energy was transferred from the support to the adsorbed substance and offered an explanation of the phenomena of heterogeneous catalysis and enzyme action. He then treated mathematically the various cases, leading up to the well-known adsorption formulæ of Langmuir and Michaelis, also showing that the relation between the temperature and the velocity of reaction as promoted by a surface was linear and not logarithmic as in homogeneous reactions and the equations given showed why supported catalysts often caused reactions to proceed at lower temperatures. Finally, it was pointed out that the effect of thorium oxide on the surface potential of nickel oxide was periodic with minima at certain molecular ratios corresponding to optimum activity as a promoter of heterogeneous catalysis.

Society of Dyers and Colourists

Scottish Section : Chemical Reactions under Pressure

DELIVERING a lecture on "Chemical Reactions Under Pressure" to the Scottish Section of the Society of Dyers and Colourists at Glasgow, on November 29, Professor W. M. Cumming, D.Sc., F.I.C., M.I.Chem.E., of the Royal Technical College, Glasgow, pointed out that pressure vessels or autoclaves had been in constant use in the dyestuff industry for the last seventy years, and it was as a result of the technique developed in this industry that the outstanding achievements in the high pressure synthesis of to-day in many fields had been made possible. He referred to reactions under pressure, which had as their aim the complete destruction of the organic matter involved; for example, in the Carius estimations and in the bomb calorimeter. He also referred to reactions in which partial disintegration of the compound took place under pressure, for example, the heating of G-salt with aqueous alkali at 280° C. under pressure, by which it was converted to 4-hydroxy-o-toluic acid.

The aim of most reactions, however, in the dyestuff industry was to introduce some more active group into the molecular structure which by its presence alters the properties of the intermediate or of the dyestuffs derived therefrom. Dr. Cumming pointed out that the use of pressure allowed liquids in contact with gases or other liquids to be heated beyond their boiling point, with the consequent activation of the molecule or group within the molecule. He discussed certain types of reaction which did not fall within the realm of pressure chemistry, and went on to discuss certain reactions well known in the dyestuff industry—alkylation, amination, carboxylation, and hydroxylation—illustrating these by reference to recent work.

After giving a description of different types of autoclaves used in the laboratory, and for industrial purposes, Dr. Cumming passed on to a consideration of some high pressure reactions which had been made possible by the development of new steels and alloys. He described the Haber process for the synthesis of ammonia, which was developed between 1904 and 1908, and discussed the reactions involved in the production of hydrogen and nitrogen. He then dealt with the high pressure synthesis of alcohols, acids, urea and the high pressure hydrogenation of fats—resulting in the formation of alcohols, of which the alkali salts, derived from their sulphuric acid esters, were of great importance as providing substitutes for fatty acid soaps. The lecture concluded with a description of the hydrogenation of coal, as illustrated by the Billingham plant, it being pointed out that, although this process was at present being used for the conversion of coal, low temperature tar and creosote to petrol, the process was capable of producing endless variety of different compounds, which in time would doubtless find an outlet in the dyestuff industry.

Bradford Section : Lubricating Oil Films

SOME properties of the lubricating oil film were dealt with in a lecture which Mr. J. E. Southcombe, M.Sc., technical director, Germ Lubricants, Ltd., delivered before the Bradford Section of the Society of Dyers and Colourists on November 21.

During the last few years, said Mr. Southcombe, it has been clearly established that there exists two separate and disinct states of lubrication, *i.e.*, that state in which the rubbing surfaces are separated by a comparatively thick layer of oil and, on the other hand, those conditions in which the lubricating layer is so thin that the frictional relationships are no longer dependent upon the laws of viscous shear. In the former case, called "fluid film" lubrication the dominating physical property of the lubricant is its viscosity and the frictional resistance of a bearing has been shown to conform to the following modulus:

$$\text{Friction} \propto \frac{\text{viscosity} \times \text{speed}}{\text{load}}$$

In lubrication by the thin adsorbed film now-a-days known as "boundary" lubrication there is no longer a function for viscosity in the equation and the friction is given as

$$F \propto \mu L$$

where μ is coefficient of friction and L = load on bearing; μ the coefficient of friction, is here found to be chiefly dependent on the chemical composition of the lubricant and the metal.

It can be shown by simple experiments that the fluid viscous film is formed solely by motion, but certain types of relative motion such as rocking and reciprocating are unfavourable to the formation of a thick film and the lubrication then becomes largely dependent upon the "boundary" phenomena. To be efficient in the "boundary" state a lubricant must contain polar molecules which adsorb on to the bearing surfaces forming a film of great mechanical stability and in one particular application of this principle polar bodies are deliberately added to mineral oil for the production of what are commercially known as "germ" oils.

For some years the Department of Scientific and Industrial Research has been engaged through its Lubrication Committee in an investigation of "boundary" friction and lubrication, and the structure and re-actions of the lubricating layer towards temperature, pressure, etc., is being studied. For this purpose some novel methods of studying thin films are being applied to lubrication such as the spreading of polar bodies on the surface of liquid mercury, the measurements of electrical capacity and the determination of the structure of the adsorbed molecules by X-ray analysis. The polar bodies contained in the oil form an oriented layer on the metal with their axes perpendicular to the surface, and this has the effect of reducing the frictional resistance and also protects the metal from seizure.

Boundary lubrication phenomena occur at the time of starting and stopping an engine, when most of the wear takes place, under very heavy loads and in motion of a reciprocating character. It is now possible to measure the lubricating efficiency by determining the coefficient of friction, and oils can be graded in accordance with their "oiliness" value. Recent work done in the laboratory of Germ Lubricants, Ltd., on the measurement of the coefficients of friction in the boun-

dary state at high temperatures, such as are encountered in the lubrication of the top ring of an internal combustion engine, was mentioned by Mr. Southcombe at the close of his lecture.

Institute of Fuel

East Midland Section : Sources of Petrols and Liquid Fuels

SOURCES of petrols and liquid fuels were discussed in a lecture which Dr. A. R. Bowen, principal of the County Technical College, Newark, delivered before the East Midland Section of the Institute of Fuel, at Lincoln, on November 29.

Dr. Bowen explained the types of geological formations in which oil occurred, and commented on the prospects of oil in this country. The location of petroleum formations by means of such instruments as the torsion balance and magnetometer, and by the seismic method, was portrayed; such methods could indeed be termed scientific oil divining. The lecturer also explained methods of drilling, using the percussion and rotary types of rig, by which depths up to ten thousand feet could be reached.

As many oil fields are located in desert and jungle country the first problem was the transport of the oil to the coast or nearest refinery. Illustrations were shown of pipe-lines which now run many hundreds of miles carrying gas or oil, and the lecturer referred to the pumps of the Iraq pipe-line, which were made in Newark. Natural gas, which is usually produced with the oil from the wells is a product of great interest and importance. The refining of crude oil into marketable products was explained and the whole range of products, including "bottled gas," petrol, solvents, burning oils, light fuel oils, lubricating oils, heavy fuel oils, vaseline, wax, asphalt and coke, were briefly described.

Allied to the petroleum industry was the Scottish shale oil industry. Here the oil does not exist in a free condition but is obtained by breaking down the organic content of the shale by heating in retorts.

Dr. Bowen concluded his lecture with a few words on the hydrogenation of coal to petrol and heavier oils. He explained how the carbonisation of coal could be influenced by the presence of hydrogen under high pressure to give oil or petrol as the main product instead of coke. Its development, necessitating the surmounting of all the difficulties inherent in a process where such highly specialised technique was employed, paid great tribute to the work of British chemists and engineers.

Society of Public Analysts

Election of New Members

AN ordinary meeting of the Society of Public Analysts was held at the Chemical Society's Rooms, Burlington House, on December 4, the president, Mr. John Evans, M.Sc., F.I.C., in the chair.

Certificates were read in favour of George E. Boizot, Frank W. Bury, George H. Croft, George J. Cunningham, Reginald S. Garlick, Robert T. M. Haines, Philip J. C. Haywood, Douglas T. Lucke, Hugh C. Moir, Jack L. Pinder, Oswald V. Richards, Henry G. Smith, William Warren, and Kenneth Wallis.

The following were elected members of the Society: Kenneth F. Allen, Vincent A. Cachia, Alfred R. Campbell, Philip Farrugia, George E. Forstner, Harry R. Knight, William G. Mitchell, Theodore L. Parkinson, Herbert S. Redgrove, Herbert N. Wilson and William Wilson.

Air-Damped Balance

The advantages of the air-damped balance in comparison with other types of rapid balances were discussed by Mr. W. N. Bond, M.A., D.Sc., F.Inst.P., who said that on a balance with a maximum load of 20 grams weighings can be carried out within 50 to 20 seconds, with an accuracy of a tenth of a milligram. In weighing masses of as much as 50 grams it is desirable to calibrate the graticule at each load. The optical system should be rigid or "changes in zero" may occur, and the scaling should be from one end of the graticule to the other. To avoid temperature disturbances, the air-damping should be at each end of the balance.

Colorimetric Analysis

Colorimetric analysis by means of the photo-electric cell was the subject of a paper by Mr. N. Strafford, M.Sc., F.I.C. Under suitable conditions the calibration curve of the photo-electric cell is virtually a straight line and can therefore be readily constructed. Once constructed, it is always available, so that in subsequent colorimetric analysis no standard comparison solutions need be prepared. The measurements are independent of the human eye and are of appreciably greater accuracy than those obtained by the simple visual colorimeters. An example of these advantages is afforded by the use of the instrument for the colorimetric determination of lead by the diphenylthiocarbazone extraction method.

Halibut Liver Oils

Dealing with the characters of 1935 halibut liver oils, Mr. Norman Evers, B.Sc., F.I.C., Mr. A. G. Jones, B.Sc., A.I.C., and Mr. Wilfred Smith, B.Sc., A.I.C., pointed out that 46 manufacturing batches of halibut liver oil have been determined. Norwegian oils (from white halibut) are superior in taste and vitamin potency to oils from the blue halibut. The minimum, maximum and average "blue values" recorded during 1935 were 495, 6,300 and 1,810 respectively. Some relationship was traced between the "blue values" and the iodine values and refractive indices of the oils. The average monthly figures for the "blue values" for the 1935 oils followed the same course as those for 1934 oils, rising to a maximum in July and reaching the minimum in November.

Institution of the Rubber Industry

Glasgow Section : Time Study

TIME study as an essential element of factory organisation was discussed by Mr. Dr. R. Burns in a paper read before the Glasgow Section of the Institution of the Rubber Industry on November 13.

During the past few years, said Mr. Burns, the subject of "time study" as a basis for wage payment has become very prominent. Time study measures labour just a a rule or micrometer may be used to measure material. The tool used is a watch, which, in the hands of a competent analyst, can be just as accurate as the rule. Although wage payment has been considered as the principal accomplishment of time study, which in itself is a very desirable attainment, the advantages it bestows on the various administrative departments can be reckoned as of equal if not more importance.

The estimating department which occupies a very prominent position in general rubber manufacture is entirely dependent on accurate data for its successful functioning. In tendering for contracts it is concerned with three factors, namely, material, labour, and overhead charges, and, of the three, labour represents the greatest problem. Cost of material can be calculated exactly and overhead charges may be arrived at with some degree of accuracy, but in the case of labour, unless the common "yard stick" of time study be used, the estimate may well be considerably wide of the mark.

To the success of the industry the estimating department makes an important contribution, as the inaccuracy of tenders may lead to one firm receiving an order which has been quoted on an unreliable forecast to its *own* loss and to the detriment of other firms.

Another important associated function of time study is that of progress and planning. When sending out inquiries, customers usually state dates for delivery, and unless accurate

data are at hand it is easy to quote deliveries which in actual practice it is impossible to adhere to. This leads to friction between customer and supplier and business is made more difficult. If recourse is made, however, to the information obtainable from time study, this difficulty need not arise. Even where small volume production is concerned, the foreman in possession of an accurate time factor can plot their production to meet delivery target date, whereas on the basis of day work production capacity cannot be relied upon. Another branch of industrial organisation dependent on accurate labour standards is the costing department. The accuracy of any cost statements is in direct proportion to the efficiency of the factory organisation and the complexity of modern business allows no guesswork. Time study makes an important contribution to the success of a costing department where standards of performance can be evaluated against forecast and where continuous analysis and recording are in practice. To meet a demand for increased production, it becomes obviously necessary for the management to devise ways and means. Where the plant is not producing to full capacity, due to careless rate-setting, expenditure on new plant may be involved. This would be avoided by proper utilisation of available plant as assessed by time study. Much has been written regarding the supposed financial benefits of certain systems of payment by results, but to the time study analyst it is a matter of complete indifference since at the most it is a question of simple arithmetic applied to the basic principle.

Time study is the study of the time taken to perform each particular operation in an industrial task, and from analysis endeavouring to fix the proper time the task as a whole should take. In other words, the purpose of time study is to find how long an operation *should* take, not how long it *does* take. The possible financial advantages of time study to any concern must depend on the conditions operating at the time of application, but in any case it is sure to yield a high return on investment if for no other reason than that expenditure is avoided on new plant due to its increased productivity.

Personal Notes

SIR J. CRIGHTON-BROWNE, D.Sc., F.R.S., recently celebrated his ninety-fifth birthday.

MR. C. EDWARDS, B.Sc., Ph.C., of Hitchin, has been elected a Fellow of the Institute of Chemistry.

PROFESSOR G. O. BANNISTER, professor of metallurgy at Liverpool University, presented the prizes to students of chemistry at the Liverpool Technical College, on December 5.

MR. J. W. HUNTER, of Edinburgh, managing director of H. W. Hunter and Son, Ltd., metal merchants, left personal estate to the value of £25,482.

MR. W. GAVIN, C.B.E., has been appointed chairman of the commission which is to investigate the banana industry in Jamaica. Mr. Gavin has for some years been associated with the fertiliser department of Imperial Chemical Industries.

DR. E. MELLINABY, F.R.S., Emeritus Professor of Physiology in the University of Oxford, in the course of a lecture at the Royal Institution, mentioned four new vitamins which had been obtained by splitting up vitamin B_2.

MR. C. BRUCE GARDNER has accepted the chairmanship of the London Iron and Steel Exchange in succession to Lord Greenwood, whose term of office will expire at the end of the year. Mr. Gardner is also chairman of Sir W. G. Armstrong Whitworth and Co., Ltd.

MR. W. M. STEPHENSON, who has been laboratory assistant in the chemistry department of the Liverpool Technical College for the past eighteen years, was the recipient of a presentation from the staff and students on December 5, on his retirement. The gift, an electric radio set, was handed over by Mr. A. E. Findlay, head of the department.

MR. W. MURRAY MORRISON, vice-chairman of the British Aluminium Co., Ltd., who has been prominent in the development of the aluminium industry in Great Britain, was last week presented with his portrait, painted by Mr. G. Kelly, R.A., together with an illuminated album signed by 426 colleagues and business associates.

MR. CLIVE COOKSON, who has been appointed chairman of the Consett Iron Co., Ltd., Co. Durham, is a well-known northern lead manufacturer, and, in addition to the Consett Iron Co., is associated as chairman with the Cookson Lead and Antimony Co., Ltd., Associated Lead Manufacturers, Ltd., Cowpen Coal Co., Hazelrigg and Burradoan Coal Co., Ltd., William Benson and Sons, Ltd., and the Mickley Coal Co., Ltd. Mr. Cookson is also on the local board of the North British and Mercantile Insurance Co., Ltd., and a director of the Consett Spanish Ore Co., Ltd.

DR. CHARLES DREYFUS, formerly managing director of the Clayton Aniline Co., Ltd., has died in Mentone, aged 86.

MR. W. COLLINSON, managing director of William Blythe and Co., Ltd., has now completed fifty years of service with them.

MR. T. GOULDEN, of Essex, a director of the Gas Light and Coke Co., and several other gas companies, left £35,839, with net personalty £30,183.

MR. W. E. S. LUNN, of Huddersfield, managing director of the Bridge Croft Dyeing Co., left £26,611, with net personalty £24,524.

MR. A. J. J. ROSS, of Falkirk, for 50 years connected with the business of James Ross and Co., chemical manufacturers, died on November 30. For many years he occupied the position of chemical manager, and retired from active participation in the business five years ago, when the name of the firm was changed to that of "The Scottish Tar Distillers, Ltd."

MR. S. J. MEISTER, chief chemist of the D.C.L., Scotland, delivered the third of a series of lectures dealing with the bakery trade under the auspices of the West of Scotland section of the National Co-operative Managers' Association last week. His subject was "Yeast and Yeast Culture." Dealing with the discovery of yeast and its properties, Mr. Meister said that practically all medical knowledge with regard to antiseptics had come from research work carried out on yeast.

MR. G. D. DELPRAT was the recipient of two awards by the Australasian Institute of Mining and Metallurgy on September 30. The first was that of honorary membership of the Institute, the only other holder of this distinction being Sir John Cadman. Mr. Delprat is the first Australian to receive this honour. He was also awarded the Institute medal which is given in recognition of eminent services to the science of mining and metallurgy. This award can be made once a year only, and this is the first occasion on which it has been given.

THE new carbon black plant of the "Sonametan" Company, at Medias (Central Transylvania), for the manufacture of the black from natural gas is now in operation, and samples of the carbon black have been sent to practically all Roumanian users. The concern expects by the end of the year to be able to produce 300 metric tons annually, which amount is practically equal to the yearly consumption of the local market. It is reported that the first samples are of the cheaper grades, but superior qualities will be made later.

Continental Chemical Notes

Germany

VANADIUM IS NOW TO BE MADE for the first time from German raw materials by a process developed by H. Zieler, using, in particular, South German ores. The process is to be exploited by the Röchling Iron and Steel Works, Völklingen.

Turkey

A LIVER OIL FACTORY is now being added to the liver oil boiling works near Trabzon, where dolphin oil is the principal product worked up.

A NOTABLE INCREASE IN THE MORPHINE CONTENT of Turkish opium up to 28 per cent. has been recently established.

Russia

ELECTROLYTIC REDUCTION OF ORTHO-NITROPHENOL in sulphuric acid with introduction of potassium iodide in the cathode compartment is claimed to yield ortho-aminophenol (Russian Pat. 39,117).

THIOPHENYL CAN BE PREPARED FROM CHLORBENZENE, according to Vorojtzov and Mützenhandler, by heating with sodium sulphide in aqueous solution in an autoclave or under pressure in a tubular system at a temperature of 300 to 380° C. Not more than one molecule of sulphide should be present for each molecule of chlorbenzene (Russian Pat. 34,554).

Italy

VERY DILUTE SOLUTIONS OF OXIDISED ADRENALINE undergo progressive decolorisation on addition of ascorbic acid, report Bonsignore and Pinotti. With ascorbic acid in 1 : 100 concentration, decolorisation is instantaneous. Ascorbic acid thus appears to exercise a reducing action upon adrenaline. Hydrogen peroxide may be used to oxidise adrenaline solutions, the excess being subsequently eliminated either by a catalase, by treatment with copper acetate (the excess of which in turn is removed with salicylaldoxime), by iodine in chloroform solution or, finally, by photochemical oxidation in an alkaline medium ("Chimie et Industrie").

Holland

AN INDEPENDENT MATCH FACTORY is to be built at Weert and is expected to employ 70 hands.

FOLLOWING THE DISCOVERY by chemists at Amsterdam University of a mustard-gas resistant impregnating agent for clothing, it is now reported from official quarters that a licensing agreement for the invention has been arranged between the Dutch government and the inventor, Professor Wibaut.

France

DRY ICE IS NOW BEING MADE in Paris by the Carbogel concern (capital 100,000 francs).

ELECTROLYSIS OF AQUEOUS SOLUTIONS can be effected without electrodes by a new method described by Klemenc at the Fifteenth Congress of Industrial Chemistry. It involves passage of a silent discharge over the aqueous solution of an electrolyte ("Industrie Chimique," November, 1935).

RECENT COMPANY REGISTRATIONS include: Soc. Francaise Bombe Pyrofuge X, in Paris, capital 500,000 francs (fire extinguishers); Laboratoires Turbée, Paris, capital 480,000 francs (sera and vaccines); Laboratoires du Paragerm, Puteau (Seine), capital 150,000 francs (cosmetics and insecticides).

COMPARATIVE TESTS ON THE BACTERICIDAL ACTION of carvacrol, thymol and menthol (on *Staphylococcus aureus*) undertaken by Gardner and Caselli ("Compte rendues," 1935, p. 1,430) revealed the marked superiority of carvacrol. Sodium carvacrolate in aqueous solution also proved notably superior to thymol.

THE COMPAGNIE D'APPLICATIONS NOUVELLES INDUSTRIELLES DU CAOUTCHOUC, of Paris, proposes to exploit certain patents relating to the production of gas-proof rubber, notably for gas masks. The company has acquired French Pat. 745,478 (improvements in respiratory apparatus for protecton against toxic and deleterious gases); also the patent of addition No. 45,036 (arsine filters).

Far-Eastern Chemical Notes

China

A COAL TAR DYESTUFFS FACTORY is to be erected in Shanghai by the Japanese Mitsui concern.

THE CHINESE GOVERNMENT intends to produce dry ice at the Shanghai works of the China Alcohol Distilling Co., a semi-state owned concern.

Sakalin

JAPANESE OIL DRILLING RIGHTS in North Sakalin have been prolonged for another two years, terminating at the end of 1938, by arrangement between the Japanese and Soviet governments. In consequence, the North Sakalin Petroleum Co. is planning to increase its output.

Japan

THE SILICON CARBIDE OUTPUT at the Omuda factory of Denki Kagaku Kogyo K.K. has now increased to 60 tons monthly.

A 50 PER CENT. INCREASE IN NAPHTHALENE PRODUCTION is planned by the Kyushu Kagaku Kogyosho. With an annual output of 2,500 tons, this firm already produces 70 per cent. of the entire Japanese consumption.

A CONSIDERABLE EXPANSION in dimethyl sulphate production is announced by the Toryu-Kagaku Kogyo K.K. at their Yokohama factory. Other principal products of this concern include H-acid (15 tons monthly), S-acid (2 tons monthly) and I-acid (5 tons monthly).

MANUFACTURE OF CELLULOSE FROM SEAWEED is planned by the newly-established Taihei Pulp Kogyo K.K. (capital 700,000 yen) and a factory is to be erected at Shiogama in the province of Miyagi. Subsequently it is planned to extend the range of products on a seaweed basis to cellulose lacquers, rubber substitutes, etc.

PHOSPHORUS PRODUCTION has now reached a considerable figure, the latest statistics giving a monthly output of 2,000 chests. A considerable export trade is carried on, red phosphorus to the value of 114,000 yen and yellow phosphorus to the value of 143,000 yen, having been exported during the first 8 months of the current year. Phosphorus manufacturers include: Toyo Denki Kogyo K.K. (Tokio); Nippon Kaguku Kogyo K.K. (Tokio); Kamayama Denka Kogyosho K.K. (Toyama). A considerable export trade is also carried on in phosphorus sesquisulphide, 30,000 kin (value 143,000 yen) having been exported during the first 8 months of the year.

Manchuria

LECITHIN IS NOW BEING MADE in Dairen by the Manshu Kagaku Kogyo K.K., who propose to enter the European market at a probable price of 1 yen per lb.

OWING TO THE KEEN DEMAND FROM EUROPE, the Manshu Kagaku Kogyo K.K. is now increasing its naphthalene production to 30 tons per month as compared with the former level of 5 tons.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THERE are no price changes to report in the markets for general heavy chemicals, rubber chemicals, wood distillation products, perfumery chemicals, essential oils and intermediates. The price of solvent naphtha, 95/160, has been advanced from 1s. 7d. to 1s. 8d. per gal. In the pharmaceutical and photographic chemicals section the price of sodium nitroprusside has been reduced from 16s. to 15s. per lb. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

LONDON.—Prices still remain firm and the demand continues steady.

MANCHESTER.—Although within measurable distance of a reasonably quiet spell in consequence of the customary year-end suspension of deliveries owing to holidays and also to stocktaking operations at many using establishments, conditions on the Manchester chemical market during the past week have been on fairly active lines and relatively good quantities of the alkalies, as well as of the potash and magnesium compounds and of the heavy acids are being taken up against specifications. Sellers report a not unsatisfactory volume of new business, the bulk of it consisting of forward contracting well into next year in many cases. Price trends are firm generally and little or no weakness is discernible. In the by-products section sellers in several instances are experiencing difficulty in meeting requirements for near delivery positions and an extremely strong market is reported in consequence.

SCOTLAND.—Business in the Scottish heavy chemical market continues mostly on contracts for the year 1936. There has been a steady day-to-day demand for home trade during the week, but export inquiries still remain limited. The prices of all qualities of boric acid have been advanced £1 10s. per ton, and prices of other products continue firm at about previous figures.

General Chemicals

ACETONE.—LONDON: £62 to £65 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—LONDON: Tech., 80%, £35 5s. to £37 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech., 80%, £38 5s., d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £27 per ton; crystal, £28; powdered, £29; extra finely powdered, £31; packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. B.P. cryst., £36; B.P. powder, £37. SCOTLAND: Crystals, £28; powdered, £29.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11¾d. per lb. MANCHESTER: 1s. SCOTLAND: 11¾d.

ACID, CRESYLIC.—97/100%, 1s. 5d. to 1s. 6d. per gal.; 99/100%, refined, 1s. 9d. to 1s. 10d. per gal. LONDON: 98/100%, 1s. 5d. f.o.r.; dark, 1s.

ACID, FORMIC.—LONDON: £40 to £45 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works. SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £54 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. LONDON: 11¼d., less 5%. SCOTLAND: 1s. 0¼d. less 5%. MANCHESTER: 1s. to 1s. 0¼d. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: £61 to £65 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 1d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £15 per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £21, ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—LONDON: £10 10s. per ton. SCOTLAND: £10 10s. to £10 15s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £9 5s.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—4s. 10d. to 5s. 1d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3¾d. to 4¼d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £3 16s. 6d. net.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £24 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £36 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £36 10s.; brown, £34 10s.

LEAD NITRATE.—£32 10s. to £34 10s. per ton.

LEAD, RED.—SCOTLAND: £25 to £27 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £42 10s.

LITHOPONE.—30%, £16 10s. to £17 per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

PHENOL.—6¾d. to 7¼d. per lb. to June 30, 1936.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £40.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5%, d/d U.K. Ground, 5¼d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99¾/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6¼d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 8¾d. per lb. SCOTLAND: B.P. crystals, 10d. to 10¼d. MANCHESTER: B.P., 11¾d. to 1s.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8¼d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8¼d. ex store. MANCHESTER: Yellow, 8¼d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. SCOTLAND: Large crystals, in casks, £36.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—LONDON: £21 10s. SCOTLAND: £20 15s.
SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.
SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. Anhydrous, 5d. per lb. LONDON: 4d. per lb. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.
SODIUM BISULPHITE POWDER.—60/62%. £20 per ton d/d 1 cwt. iron drums for home trade.
SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash, £7 ex quay, min. 4-ton lots with reductions for contracts.
SODIUM CHLORATE.—£32 10s. per ton. SCOTLAND: 3⅜d. per lb.
SODIUM CHROMATE.—4d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s..
SODIUM META SILICATE.—£14 per ton, d/d U.K. in cwt. bags.
SODIUM IODIDE.—B.P., 6s. per lb.
SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.
SODIUM PERBORATE.—10%, 9¼d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£13 per ton.
SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 5d. to 5½d.
SODIUM SILICATE.—140° Tw. Spot, £8 per ton. SCOTLAND: £8 10s.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material, £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid, 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.
SODIUM SULPHITE.—Pea crystals, spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.
SULPHUR.—£9 10s. to £9 15s. per ton. SCOTLAND: £8 to £9.
SULPHATE OF COPPER.—MANCHESTER: £14 17s. 6d. to £16 per ton f.o.b.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 4s. 8d. per lb. in 1-cwt. lots.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.
ZINC SULPHIDE.—10d. to 11d. per lb.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8 to £9. Grey, £11. Liquor, brown, 30° Tw., 8d. per gal. MANCHESTER: Brown, £9 10s.; grey £11 10s.
CHARCOAL.—£4 15s. to £10 per ton, according to grade and locality.
METHYL ACETONE.—40-50%, £43 to £46 per ton.
WOOD CREOSOTE.—Unrefined, 3d. to 1s. 3d. per gal.
WOOD NAPHTHA, MISCIBLE.—2s. 6d. to 3s. 6d. per gal.; solvent, 3s. 3d. to 4s. 3d. per gal.
WOOD TAR.—£2 to £2 10s. per ton.

Coal Tar Products

ACID, CRESYLIC.—90/100%, 2s. to 2s. 7d. per gal., according to specification; pale 98%, 1s. 9d. to 1s. 10d.; dark, 1s. 5d. to 1s. 6d. LONDON: 98/100%, 1s. 4d.; lark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s 1d.; high boiling acid, 2s. 6d. to 3s.
ACID, CARBOLIC.—Crystals, 6¾d. to 7¼d. per lb.; crude, 60's, 1s. 11½d. to 2s. 2¼d. per gal. MANCHESTER: Crystals, 7¼d. to 7½d. per lb.; crude, 2s. 5d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.
BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 3¼d. SCOTLAND: Motor, 1s. 6¼d.
CREOSOTE.—B.S.I. Specification standard, 5¾d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 5½d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4½d.; heavy, 4¼d. to 4½d.
NAPHTHA.—Solvent, 90/100%, 1s. 5½d. to 1s. 6½d. per gal.; 95/160%, 1s. 8d.; 90%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.
NAPHTHALENE.—Crude, whizzed or hot pressed, £10 10s. per ton; purified crystals, £13 10s. per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.
PYRIDINE.—90/140%, 5s. 6d. to 8s. per gal.; 90/180, 2s. 3d.
TOLUOL.—90%, 2s. 3d. to 2s. 4d. per gal.; pure, 2s. 6d. to 2s. 7d.
XYLOL.—Commercial, 2s. 3d. per gal.; pure, 2s. 4d.
PITCH.—Medium, soft, 35s. to 36s. per ton, in bulk at makers' works.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9¼d. per lb.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID NAPHTHIONIC.—1s. 8d. per lb.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100%, d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.
BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.
BENZIDINE HCL.—2s. 5d. per lb.
p-CRESOL 34-5° C.—1s. 9d. per lb. in ton lots.
m-CRESOL 98/100%.—1s. 11d. per lb. in ton lots.
DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 10½d.
DINITROCHLORBENZENE, SOLID.—£72 per ton.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—Spot, £78 15s. per ton, in paper bags.
α-NAPHTHYLAMINE.—Spot, 11½d. per ton., d/d buyer's works.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.
o-NITRANILINE.—3s. 11d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.
NITRONAPHTHALENE.—10d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.
o-TOLUIDINE.—9½d. to 11d. per lb.
p-TOLUIDINE.—1s. 11d. per lb.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—The price for December delivery is £7 5s. per ton, less 4s. 6d., neutral quality basis 20.6% nitrogen in 6-ton lots delivered to farmer's nearest station.
CALCIUM CYANAMIDE.—Prices for the remainder of the fertiliser year 1935/36 are: December £7, January £7 1s. 3d., February £7 2s. 6d., March £7 3s. 9d., April/June, £7 5s., delivered in 4-ton lots.
NITRO-CHALK.—The price for the 1935/36 season is £7 5s. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.
NITRATE OF SODA.—The price for the 1935/36 season is £7 12s. 6d. per ton delivered in 6-ton lots to farmer's nearest station—all terms and conditions the same as for the season 1934/35.
CONCENTRATED COMPLETE FERTILISERS.—£10 10s. to £10 19s. per ton according to analysis, delivered in 6-ton lots to farmer's nearest station.
AMMONIUM PHOSPHATE (N.P.) FERTILISERS.—£10 5s. to £13 15s. per ton according to analysis, delivered in 6-ton lots to farmer's nearest station.

New Companies Registered

Ridsdale & Co., Ltd., "Elmslie," The Avenue, Marton in Cleveland, Yorks.—Registered November 28. Nominal capital £300. To acquire the business of analytical and metallurgical chemists carried on by Ridsdale and Co., at 3 Wilson Street, Middlesbrough. Directors: N. D. Ridsdale, Mrs. D. Ridsdale.

The British Iron & Steel Corporation, Ltd., 44 Campden Hill Gate, W.8.—Registered December 2. Nominal capital £1,000. Dealers in and importers and exporters of iron, steel, metals and minerals, manufacturers of and dealers in iron and steel products and alloys, miners, metallurgists, chemists, manufacturers of chemicals and manures, distillers, dye makers, gas producers, manufacturers and letters on hire of and dealers in machinery, gears, apparatus, tools and engineering products, etc. A subscriber: J. Henderson.

Wiltshire Tyre and Rubber Company, Ltd., 8 Queen Street, E.C.4.—Registered December 4. Nominal capital £100. Producers and manufacturers of and dealers in rubber, vegetable and other gums, chemicals and fabrics, etc. A subscriber: Ernest Mitchell.

Chemical and Allied Stocks and Shares

Price Movements in Favour of Holders

THERE have been active features among shares of chemical and associated companies this week, and on balance price movements have, with few exceptions, been in favour of holders. Imperial Chemical are virtually unchanged at the time of writing, but the preference moved up nearly 1s. Subsequently there was a tendency to exchange from the preference into the ordinary on the view that the latter appear relatively undervalued. The upward trend in Fison, Packard and Prentice was continued with a further gain of 1s. 3d. to 45s. Cooper, McDougall and Robertson were firm and more active, while British Cyanides received increased attention on the apparently very satisfactory yield offered on the basis of last year's 8 per cent. dividend, and Burt, Boulton and Haywood were again rather more active than usual. Monsanto Chemicals 5½ per cent. redeemable £1 preference was another share in larger request. The price is around 23s. at which the yield is nearly 4¾ per cent. On the basis of the results for the second half of 1934, the preference dividend is covered more than six times over. Although the first accounts covering a full year of the present company do not fall to be issued until March, the company, of course, owns an old-established business which manufactures over 80 chemical products, and it has a service agreement with the Monsanto Chemical Co., St. Louis Distillers were again higher, as were United Molasses, the last-named being assisted by the full report for the past year. International Nickel were again very active in sympathy with other shares which have a market on both sides of the Atlantic. Low Temperature Carbonisation did not benefit quotably from the past year's results and the moderately higher dividend. B. Laporte were active but are little changed on the week at the time of writing. On the basis of last year's dividend of 20 per cent. the yield offered is small, but this has to be read in relation to the good earning capacity of the business and the prospects of a favourable increase in distribution, possibly in the form of a share bonus, as the latter is considered quite likely in the market. William Blythe changed hands more frequently around 6s. Last year the dividend on these 3s. shares was 10 per cent., so that the yield is a clear 5 per cent. Last year a good proportion of the profits was placed back into the business. In respect of the current year the interim dividend has been maintained at 3 per cent. British Glues were in demand and have transferred up to the higher price of 8s. 3d. United Premier Oil and Cake remained prominent with a further gain on the week from 9s. 9d. to 10s. 6d. in response to a wider realisation of the estimates of the final dividend current in the market. In other directions Imperial Smelting were bought on any reaction, but they show a tendency to move with the price of zinc in view of the importance of the latter to the company's profits. Salt Union were rather better subsequently. Unilever were little changed on balance. Because of the company's widespread business and the influence of raw material prices and currency movements on its earnings, the market realises it is very difficult to form a considered opinion as to its progress, but the present price of the shares indicates confidence that profits are on the up-grade and that a larger dividend is very possible.

Name.	Dec. 10.	Dec. 3.
Anglo-Iranian Oil Co., Ltd. Ord.	68/9	68/1½
,, 8% Cum. Pref.	37/-	37/3
,, 9% Cum. Pref.	38/3	38/3
Associated Dyers and Cleaners, Ltd. Ord.	2/6	2/6
,, 6½% Cum. Pref.	5/3¾	5/3¾
Associated Portland Cement Manufacturers, Ltd. Ord.	65/-	65/6
,, 5½% Cum. Pref.	28/-	28/-
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	2/6	2/6
Berger (Lewis) & Sons, Ltd. Ord.	65/7½	65/1½
Bleachers' Association, Ltd. Ord.	7/6	6/3
,, 5½% Cum. Pref.	12/6	11/10½
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	20/-	20/-
Boots Pure Drug Co., Ltd. Ord. (5/-)	49/6	49/-
Borax Consolidated, Ltd. Pfd. Ord. (£)	100/-	100/-
,, Defd. Ord.	17/6	17/6
,, 5½% Cum. Pref. (£10)	£11/2/6	£11/2/6
,, 4½% Deb. (1st Mort.) Red. (£100)	£109	£109
,, 4½% 2nd Mort. Deb. Red. (£100)	£102	£102
Bradford Dyers' Association, Ltd. Ord.	10/7½	10/7½
,, 5% Cum. Pref.	12/6	12/6
,, 4% 1st Mort. Perp. Deb. (£100)	£88	£88
British Celanese, Ltd. 7% 1st Cum. Pfd.	25/6	25/6
,, 7½% Part 2nd Cum. Pref.	23/3	22/6
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	6/3	6/3
,, 4% 1st Mort. Deb. Red. (£100)	£94	£94
British Cyanides Co., Ltd. Ord. (2/-)	3/1½	3/-
British Drug Houses, Ltd. Ord.	18/9	18/9
,, 5% Cum. Pref.	21/3	21/3
British Glues and Chemicals, Ltd. Ord. (4/-)	8/1½	7/3
,, 8% Pref. (Cum. and Part.)	28/1½	28/1½
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	48/9	48/9
,, 5½% Cum. Pref.	26/3	26/3
,, 4½% First Mort. Deb. Red. (£100)	£108/10/-	£108/10/-
British Oxygen Co., Ltd. Ord.	115/-	112/6
,, 6½% Cum. Pref.	32/6	32/6
British Portland Cement Manufacturers, Ltd. Ord.	85/-	87/6
,, 6% Cum. Pref.	30/6	30/6
Bryant & May, Ltd. Pref.	66/3	66/3
Burt, Boulton & Haywood, Ltd. Ord.	20/-	20/-
,, 7% Cum. Pref.	27/6	27/6
,, 6% 1st Mort. Deb. Red. (£100)	£105/10/-	£105/10/-
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	108/9	108/9
,, 4% 1st Mort. Deb. Red. (£100)	£96/10/-	£96/10/-
Calico Printers' Association, Ltd. Ord.	9/4½	9/4½
,, 5% Pref. (Cum.)	15/11	15/11
Cellulose Acetate Silk Co., Ltd. Ord.	13/4	13/4
,, Deferred (1/-)	2/1½	2/4½

Name.	Dec. 10.	Dec. 3.
Consett Iron Co., Ltd. Ord.	11/6	10/9
,, 8% Pref.	28/9	28/9
,, 5% First Deb. stock, Red. (£100)	£107/10/-	£107/10/-
Cooper, McDougal & Robertson, Ltd. Ord.	28/9	36/3
,, 7% Cum. Pref.	30/-	30/-
Courtaulds, Ltd., Ord.	56/3	55/7½
,, 5% Cum.	26/3	26/3
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre-Pref.	25/-	25/-
,, Cum. 6% Pref.	28/9	28/9
,, 6½% Cum. Pref.	30/7½	30/7½
,, 7½% "A" Cum. Pref.	30/7½	30/7½
Distillers Co., Ltd. Ord.	98/6	97/6
,, 6% Pref. Stock Cum.	31/6	31/6
Dorman Long & Co., Ltd. Ord.	23/-	21/10½
,, Pref. Ord.	28/9	29/4½
,, 6½% Non-Cum. 1st Pref.	23/3	23/3
,, 8% Non-Cum. 2nd Pref.	22/3	22/3
,, 4% First Mort. Perp. Deb. (£100)	£102/10/-	£102/10/-
,, 5% 1st Mort. Red. Deb. (£100)	£106/10/-	£106/10/-
English Velvet & Cord Dyers' Association, Ltd. Ord.	5/-	5/-
,, 5% Cum. Pref.	8/9	8/9
,, 4% First Mort. Deb. Red. (£100)	£73/10/-	£73/10/-
Fison, Packard & Prentice, Ltd. Ord.	45/-	43/9
,, 7% Non-Cum Pref.	31/3	31/3
,, 4½% Debs. (Reg.) Red. (£100)	£106	£106
Gas Light & oke Co. Ord.	27/9	28/-
,, 3½% Maximum Stock (£100)	£89/10/-	£89/10/-
,, 4% Consolidated Pref. Stock (£100)	£107	£106/10/-
,, 3% Consolidated Deb. Stock, Irred. (£100)	£90	£90
,, 5% Deb. Stock Red. (£100)	£114/10/-	£114/10/-
,, 4½% Red. Deb. Stock (1960-65) (£100)	£112/10/-	£112/10/-
Goodlass Wall & Lead Industries, Ltd. Ord. (10/-)	14/4½	14/4½
,, 7% Prefd. Ord. (10/-)	13/9	13/9
,, 7% Cum. Pref.	28/9	28/9
Gossage, William, & Sons, Ltd. 5% 1st Cum. Pref.	24/4½	24/4½
,, 6½% Cum. Pref.	28/9	28/9
Imperial Chemical Industries, Ltd. Ord.	37/-	36/9
,, Deferred (10/-)	9/-	9/-
,, 7% Cum. Pref.	34/-	33/-
Imperial Smelting Corporation, Ltd. Ord.	15/6	15/-
,, 6½% Pref. (Cum.)	24/3	24/-
International Nickel Co. of Canada, Ltd. Cum.	$46¼	$41½
Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	105/-	105/-
,, 4% Mort. Deb. Red. (£100)	£98/10/-	£98/10/-
Laporte, B., Ltd. Ord.	115/-	116/3

Name.	Dec. 10.	Dec. 3.
Lawes Chemical Co., Ltd. Ord. (1/-)	6/3	6/3
,, 7% Non-Cum. Part Pref. (10/-)	10/-	10/-
Lever Bros., Ltd. 7% Cum. Pref.	31/9	31/6
,, 8% Cum. "A" Pref.	33/6	33/-
,, 20% Cum. Prefd. Ord.	77/6	77/6
,, 5% Cons. Deb. (£100)	£106/10/-	£106/10/-
,, 4% Cons. Deb. (£100)	£105/10/-	£103/10/-
Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3
,, 6% 2nd Pref. (5/-)	6d.	6d.
,, 6% 1st Debs. (Reg.)	£42/10/-	£42/10/-
Major & Co., Ltd. Ord. (5/-)	7½d.	7½d.
,, 8% Part. Prefd. Ord. (10/-)	9d.	9d.
,, 7½% Cum. Pref.	1/6¾	1/6¾
Pinchin, Johnson & Co., Ltd. Ord. (10/-)	43/-	43/-
,, 1st Pref. 6½% Cum.	32/-	32/-
Potash Syndicate of Germany (Deutsches Kalisyndikat G.m.b.H.) 7% Gld. Ln. Sr. "A" and "B" Rd.	£71	£71
Reckitt & Sons, Ltd. Ord.	115/7½	116/3
,, 4½% Cum. 1st Pref.	24/4½	24/4½

Name.	Dec. 10.	Dec. 3.
Salt Union, Ltd. Ord.	43/9	43/9
,, Pref.	45/-	45/-
,, 4½ Deb. (£100)	£109/10/-	£109/10/-
South Metropolitan Gas Co. Ord. (£100)	£133/10/-	£133/10/-
,, 6% Irred. Pref. (£100)	£149/10/-	£149/10/-
,, 4% Pref. (Irred.) (£100)	£107	£107
,, Perpetual 3% Deb. (£100)	£89/10/-	£89/10/-
,, 5% Red. Deb. 1950-60 (£100)	£116/10/-	£116/10/-
Staveley Coal and Iron Co., Ltd. Ord.	47/6	46/10½
Stevenson & Howell, Ltd. 6½% Cum. Pref.	26/3	26/3
Triplex Safety Glass Co., Ltd. Ord. (10/-)	83/9	83/1½
Unilever, Ltd. Ord.	30/-	30/-
,, 7% Cum. Pref.	29/9	29/3
United Glass Bottle Manufacturers, Ltd. Ord.	44/6	44/-
,, 7½% Cum. Pref.	33/-	33/-
United Molasses Co., Ltd. Ord. (6/8)	20/-	20/-
,, 6% Cum. Pref.	25/-	25/-
United Premier Oil & Cake Co., Ltd. Ord. (5/-)	10/3	10/-
,, 7% Cum. Pref.	25/-	25/-
,, 6% Deb. Red. (£100)	£102/10/-	£102/10/-

Inventions in the Chemical Industry

Patent Specifications and Applications

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Open to Public Inspection

Ferric sulphate chloride containing water of crystallisation, manufacture.—Röhm and Haas A.-G. May 31, 1934. 13592/35.

Influencing the decomposition of hydrocarbons in chemical processes, process and apparatus.—Goerig and Co. A.-G. May 28, 1934. 14366/35.

Purification of nitro-benzene, processes.—Lonza Elektrizitätswerke und Chemische Fabriken A.-G. June 2, 1934. 14544/35.

Azo dyestuffs, manufacture.—I. G. Farbenindustrie. May 26, 1934. 15397/35.

Products from cellulose and cellulose derivatives, manufacture.—Deutsche Bekleidungsindustrie G. June 1, 1934. 15416/35.

Thiourea derivative, process for manufacture.—I. G. Farbenindustrie. May 29, 1934. 15551/35.

Condensation products from urea, formaldehyde, and hexamethylenetetramine, manufacture.—Soc. of Chemical Industry in Basle. May 29, 1934. 15638/35.

Alkali metal peroxides, manufacture and production.—I. G. Farbenindustrie. May 30, 1934. 15758/35.

Deoxidation of ferrous metals with cyclic utilisation and regeneration of slags, process.—Soc. D'Electro-Chimie, D'Electro-Metallurgie, et des Acieries Electriques D'Ugine. June 2, 1934. 16124/35.

4-amino-dinitrodiphenylamines and of azo dystuffs therefrom, manufacture.—I. G. Farbenindustrie. June 2, 1934. 16178/35.

Specifications Accepted with Date of Application

Hydrogen peroxide solutions, purification.—E. I. du Pont de Nemours and Co. and A. T. Hawkinson. May 14, 1934. 438,886.

Condensation products of the formaldehyde-urea type, manufacture.—W. Kraus. May 18, 1933. 438,887.

Iron carbonyl, manufacture and production.—Coutts and Co. and F. Johnson (I. G. Farbenindustrie). May 22, 1934. 438,893.

Phenanthrene derivatives, manufacture.—Imperial Chemical Industries, Ltd., E. de B. Barnett and C. A. Lawrence. May 23, 1934. 438,894.

Zinc coating a ferrous article and the product obtained thereby, process.—A. H. Stevens (Indiana Steel and Wire Co.). May 25, 1934. 438,896.

Higher aliphatic and cycloaliphatic sulphonic acids, manufacture.—W. J. Tennant (Henkel and Cie, Ges.). May 28, 1934. 439,177.

Vat dyestuffs, manufacture.—A. Carpmael (I. G. Farbenindustrie). May 28, 1934. 439,180.

Resorcinol, production.—E. I. du Pont de Nemours and Co. May 26, 1933. 439,053.

Organic cyanogen compounds, manufacture.—E. I. du Pont de Nemours and Co. May 26, 1933. 439,054.

Amines, manufacture.—E. I. du Pont de Nemours and Co. May 26, 1933. 439,055.

Phenol, synthesis.—E. I. du Pont de Nemours and Co. May 26, 1933. 439,056.

Basic copper chlorides, manufacture.—I. G. Farbenindustrie. May 31, 1933. 439,188.

Substituted aldols, manufacture.—I. G. Farbenindustrie. June 2, 1933. 439,195.

Dyestuffs of the triarylmethane series, process for manufacture. I. G. Farbenindustrie. June 3, 1933. 439,200.

Obtaining alkaline-earth metals by electrolysis.—G. N. Kirsebom and Calloy, Ltd. June 2, 1934. 439,204.

Waxes, fats, or mixtures of higher fatty acid esters, or of higher alcohols, treatment.—Edeleanu G. July 12, 1933. 439,128.

Separating platinum metals from mattes, methods.—Mond Nickel Co., Ltd. Nov. 17, 1933. 438,996.

Applications for Patents

(November 28 to December 4 inclusive.)

Purification of gases, apparatus.—Ateliers J. Hanrez Soc. Anon. (Belgium, Jan. 12.) 33136.

Precipitating, etc., substances from aqueous solutions, process. A. G. Black and P. Evans. 33410.

New oxyketones and their esters, manufacture.—A. G. Bloxam (Soc. of Chemical Industry in Basle). 32964.

Polyoxy-carboxylic acids or their salts, manufacture.—A. G. Bloxam (M. Finkelstein). 33275.

Polymerised haloprenes.—Boston Blacking Co., Ltd. (United States, Dec. 3, '34.) 33242.

Acridine derivatives, manufacture.—A. Carpmael (I. G. Farbenindustrie). 33064.

Condensation products, manufacture.—A. Carpmael (I. G. Farbenindustrie). 33065, 33164.

Dyestuffs, manufacture.—A. Carpmael (I. G. Farbenindustrie). 33163.

Thiobarbituric acid compounds, manufacture.—A. Carpmael (I. G. Farbenindustrie). 33486.

Improving mineral lubricating oils, process.—Coutts and Co. (I. G. Farbenindustrie). (April 3, '34.) 33175.

Lead ores, treatment.—F. Dietzsch and S. Hogg. 33024.

Glycol derivatives, production.—Distillers Co., Ltd., J. E. Youell and H. M. Stanley. 33496.

Esters of the acids of phosphorus and their manufacture.—E. I. du Pont de Nemours and Co. 33517.

Ammonium nitrate, production.—E. I. du Pont de Nemours and Co. (United States, Jan. 10.) 33665.

Resolving mixtures of liquid hydrocarbons, process.—Edeleanu G., and W. Grote. 33128.

Silica gell solutions and compounds.—E. V. Hayes-Gratze. 33590.

Emulsification, apparatus.—T. Hogg. 33431.

Fluorine compounds of aliphatic hydrocarbons, manufacture.—I. G. Farbenindustrie. (Germany, Nov. 29, '34.) 33173.

Sulphuric acid, manufacture.—Imperial Chemical Industries, Ltd. (United States, Nov. 30, '34.) 33408.

Vat dyestuffs, production.—G. W. Johnson (I. G. Farbenindustrie). 33022.

ACETALDEHYDE FROM GASES containing acetylene, production.—G. W. Johnson (I. G. Farbenindustrie). 33023.

PRODUCTS CONTAINING VALUABLE HYDROCARBONS or their derivatives, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 33177.

ALUMINIUM, colouration, etc.—G. W. Johnson (I. G. Farbenindustrie). 33251.

DYESTUFFS OF THE ANTHRAQUINONE SERIES, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 33252.

LEAD FOR WRITING PURPOSES, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 33353.

DETINNING SUBSTANCES, particularly waste, containing tin.—G. W. Johnson (I. G. Farbenindustrie). 33498.

ALPHA-BETA-UNSATURATED ACID AMIDES from ketone cyanhydrine, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 33499.

CAPILLARY-ACTIVE CARBOXYLIC ACID AMINES, manufacture.—G. W. Johnson (I. G. Farbenindustrie). 33617.

BARIUM SULPHATE, manufacture.—B. Laporte, Ltd., I. E. Weber and W. S. Wood. 33171.

THERAPEUTICALLY VALUABLE COMPOUNDS of the aromatic series, preparation.—P. May (Soc. des Usines Chimiques Rhone-Poulenc). 33195.

PARAFFIN WAX EMULSIONS, production.—E. E. Mayer. (Germany, Oct. 12.) 33187.

ALLOYS OF NICKEL AND RHODIUM.—Mond Nickel Co., Ltd. (United States, Dec. 5, '34.) 33530.

ORGANIC, ETC., MATERIALS, treating.—National Processes, Ltd. 33521.

CONTROLLING SULPHONATION of hydrocarbon oils, process.—H. Nielsen. 33153.

ELECTROLYTIC PRODUCTION OF ESTERS.—Nitroglycerine Aktiebolaget. (Sweden, Dec. 10, '34.) 33563.

METAL ALLOY.—C. M. Openshaw. 33437.

ESTERS OF THE ACIDS OF PHOSPHORUS and their manufacture.—P. L. Salzberg. 33517.

SUBSTITUTED PYRIDINE-ORTHODICARBOXYLIC ACID AMINES, manufacture.—Soc. of Chemical Industry in Basle. (Switzerland, Dec. 5, '34.) 33025.

ZINC OXIDE, manufacture.—Soc. Italiana Pirelli. (Italy, Dec. 1, '34.) 33363.

DETECTING HALOGENATED ORGANIC VAPOURS, etc., impurities in air, apparatus.—L. B. Timmis. 33126.

ESTERS OF METHACRYLIC ACID, synthesis.—Triplex Safety Glass Co., Ltd., and J. Wilson. 33062.

From Week to Week

THE LIBRARY of the Chemical Society will be closed for the Christmas holidays from December 23 at 9 p.m. until December 30 at 10 a.m.

NEW WORKS ARE TO BE ERECTED on the banks of the Sankey and St. Helens Canal, near Warrington, for the production of activated carbon, used in the purification of commercial products. The project is the scheme of the Mersey White Lead Co., Sankey. The company is to produce under licence in this country in accordance with German patents.

THE FIRST FRENCH FACTORY for the manufacture of synthetic petrol has been inaugurated at Mazingarde, near Bethune. The factory was built by the Compagnie des Mines de Bethune with the aid of the National Liquid Fuel Department. The process that is being used was worked out in the mining company's laboratories. The present factory enables 50 tons of coal to be treated in 24 hours.

THE TREASURY HAS ISSUED an additional Import Duties Order raising the specific duty on linseed oil from £3 10s. to £5 per ton. Under the Ottawa Agreements Act, a duty of 10 per cent. is in force on foreign linseed, and, owing to the increased imports of oil, the committee is satisfied that the production of linseed oil in this country will be seriously endangered unless further assistance be accorded to the industry. The rate of duty now imposed will secure to the home manufacturers a protection equivalent at recent prices to about 10 per cent. *ad valorem*.

AN ACCIDENT WHICH RESULTED in a Washington chemical worker, Thomas Sinclair, having part of his trousers caught by a piece of machinery and being torn off his leg, and himself being severely bruised, had a sequel at Chester-le-Street Police Court on December 4, when the Mid-Durham Carbonisation Co., Ltd., who employed Sinclair, were fined £3. The charge was that a dangerous piece of machinery was not fenced. The company pleaded guilty on a technical count, and in view of the fact that an inspection of the works had previously resulted in several recommendations being made, among which was a suggestion as to the future fencing of the piece of machinery concerned. Thomas Sinclair admitted that his official direction was that he was not to oil the machinery when this particular part of it was in motion, and he also admitted that it was foolish to disobey this direction. The Bench decided that the failure to fence the offending piece of machinery was an oversight on the part of the management.

HARRY ATHEY, of Brown Street, Rotherham, an employee of the United Steel Co., Ltd., appealed in the Court of Appeal on December 6 from a judgment of Judge Frankland, declining to grant him a declaration of liability under the Workman's Compensation Act. Mr. E. W. Cave, K.C. (for Athey), said he asked for the addition to the Judge's judgment of words that would enable Athey to apply for compensation in future, if it became necessary. Athey lost an eye while at work, and was paid compensation, but afterwards he was able to return to work. The County Court Judge decided that, inasmuch as he was able to do his work, and with no likelihood of any mischief supervening, he was not entitled to a declaration of liability. Mr. Sellers, K.C. (for the United Steel Co.), while arguing that the Judge was right, said his clients did not desire to prevent Athey being able to make a future application on proper evidence. Lord Justice Slesser said the Court was of opinion that there should be added to the words of the Judge declining to make the declaration these words: "Without prejudice to the right of the applicant to make further application for compensation or declaration of liability or otherwise."

FIRE BROKE OUT at the premises of the Scottish Agricultural Industries at Blaikie's Quay, Aberdeen, late on December 9. The firemen confined the outbreak to the fertiliser department and had some difficulty in working among phosphates, potash and lime.

HOWARDS AND SONS, LTD., announce that their works, warehouses and offices will be closed on December 25 and December 26. Their warehouses will be closed also on Monday, December 30 and Tuesday, December 31, for stocktaking.

AN AGREEMENT HAS BEEN MADE between Oxford University and the Czechoslovakian Government by which the Government lent 1636.6 mg. of Jachymov radium to the Oxford University for three years. The radium is insured to the extent of £20,000 and is to be employed for experimental purposes.

NEGRETTI AND ZAMBRA have received the order for the complete equipment of dial thermometers and pyrometers for the engine and boiler rooms of the Q.S.T.S. "Queen Mary." The installation comprises 112 mercury-in-steel dial thermometers and 24 thermo-electric pyrometers.

LORD MACMILLAN presided over a gathering of 815 members and guests at the second annual dinner of the British Gas Federation at Grosvenor House, on Wednesday, December 11. The speakers were Lord Kennet, Lord Macmillan, Sir David Milne-Watson and Viscount Falmouth. Lord Macmillan is succeeded as president by the Earl of Dudley.

OFFICIAL FIGURES WILL SHOW that in the monthly output and the average daily output Sheffield steelmakers during October broke all previous records in the history of the Sheffield steel trade. The total of 134,400 tons exceeds that of October last year by 19,000 tons and is nearly 10,000 tons more than the next previous high record, in March, 1934. The daily output during October averaged 4,977 tons.

ON THE RECOMMENDATION of the Import Duties Advisory Committee, Import Duties (Exemptions) (No. 12) Order, 1935 (S.R. & O. 1935 No. 1180) provides for the addition to the free list, as from December 10, 1935, of the natural but not terpeneless essential oils, neroli and petitgrain. The committee states in its report that it has previously refrained from making any recommendation in regard to these oils because of the possibility that adequate supplies free of duty might be available from Empire sources, but it is now satisfied that sufficient supplies from within the Empire are not forthcoming.

AN INQUEST WAS HELD at Newton Abbot on December 5 on three victims of silicosis. The coroner stated that the men were employed as miners at the Great Rock Mine, of which the product was iron oxide. Silicosis was an industrial disease and could be contracted by men employed in a mine where there was silica. The county analyst stated that he visited the Great Rock Mine on August 7 and took specimens of the rock, which consisted of granite and small veins of ore. A sample analysed showed free silica 27.2 per cent. and total silica 64.5 per cent. Dr. W. A. Robb, pathologist of the Royal Devon and Exeter Hospital, gave evidence of having examined the organs of the men, and the coroner intimated that the Silicosis Board had given certificates in the three cases that death was due to silicosis accompanied with tuberculosis. The coroner remarked that he was surprised that the Ministry of Mines was not represented at the inquiry. A verdict was returned that the men contracted the disease whilst employed at the mine, and it was the unanimous opinion of the jury that all known precautions had been carried out by the employing company.

Forthcoming Events

LONDON

Dec. 17.—Annual Chemical Dinner. 7 p.m. Wharncliffe Rooms, Hotel Gt. Central, London.

Dec. 18.—Electrodepositors' Technical Society. Discussion on "Bright Nickel," opened by S. Field. 8.15 p.m. Northampton Polytechnic Institute, St. John Street, Clerkenwell, London.

Dec. 18.—Society of Chemical Industry (Road and Building Materials Group). "Identification of Bitumens by Colorimetric Methods." D. C. Broome. 8 p.m. Burlington House, Piccadilly, London.

Dec. 19.—Chemical Society. Ordinary scientific meeting. Burlington House, Piccadilly, London.

BIRMINGHAM

Dec. 17.—Institute of Metals (Birmingham Section). "Recent Developments in Refractories." Christopher E. Moore. 7 p.m. James Watt Memorial Institute, Birmingham.

Dec. 19.—Institute of Vitreous Enamellers. "Observation on Cast Iron with Reference to Vitreous Enamelling. H. T. Angus. 7.30 p.m. Chamber of Commerce, New Street, Birmingham.

GLASGOW

Dec. 16.—Institute of Metals (Scottish Section). "The Addition of Non-Ferrous Metals to Cast Iron." J. E. Hurst. 7.30 p.m. 39 Elmbank Crescent, Glasgow.

Dec. 20.—Society of Dyers and Colourists (Scottish Section). "The Cleaning Industry—Practice and Prospect." J. W. Bardsley. 7.30 p.m. St. Enoch Hotel, Glasgow.

HULL

Dec. 17.—Hull Chemical and Engineering Society. "Rubber." H. N. Kay. 7.45 p.m. Municipal Technical College, Park Street, Hull.

MANCHESTER

Dec. 16.—Institution of the Rubber Industry (Manchester Section). "New Markets to Conquer." D. McLachlan. 7 p.m. 17 Albert Square, Manchester.

Company News

W. and H. M. Goulding.—The payment of an interim dividend of 3 per cent. is announced on the ordinary shares.

Lancegaye Safety Glass (1934).—An interim of 2½ per cent., less tax, the same as last year, is announced, payable on December 18.

British Oxygen Co.—The payment is announced of the dividend for the half-year to December 31 on the 6½ per cent. cumulative preference stock.

Bradford Dyers' Association.—The directors announce that they have decided to postpone payment of the dividend on the £2,549,237 of 5 per cent. preference stock for the six months ending December 31. Dividends on these shares are in arrear since December, 1932. No distribution has been made on the £2,258,794 ordinary capital since 1929-30. The interest on the 4 per cent. debenture stock will be paid as usual on January 1.

Boots Pure Drug Co.—The usual quarterly ordinary dividend of 6 per cent., less tax, is announced, payment of which will be made on December 31. This makes a total of 18 per cent. paid so far on account of the current year. For 1934-35 the total distribution was 29 per cent., including a bonus of 5 per cent., tax free.

Ilford, Ltd.—An increase of £11,169 to £107,419 in net profits is announced. The ordinary dividend is raised by 1 per cent., to 7 per cent. New issue expenses amounting to £15,787 have been written off, and £100,000 placed to special reserve for foreign debts. After meeting the preference dividends, a surplus of £16,926 is carried forward, compared with £20,045 brought in.

Timothy Whites & Taylors.—The report for the year to September 28 last shows that profit, including dividends from subsidiary companies, etc., amounts to £277,759. After deducting debenture interest and preference dividend there is a balance of £128,176, compared with an estimate of £122,500 at the time of the merger. A final dividend of 15 per cent., less tax, is to be paid, making 22½ per cent. for the year. The carry-forward is increased from £29,411 to £36,894.

Celanese Corporation of America.—A dividend of $1.75 per share has been declared on the 7 per cent. cumulative series prior deferred stock, payable January 1 next, and a dividend of $3.50 per share on the 7 per cent. cumulative first participating preferred stock, payable December 31 next. An accounting for participating dividend on the preferred stock will be made after the accounts for the calendar year are made up and audited, which is expected to be some time in February.

Zinc Corporation.—An interim participating dividend is announced of 2s. per share, less tax, on both the ordinary and preference shares in respect of the year to December 31 next. This compares with 6d. paid a year ago, which was followed by a final payment of 1s., making 1s. 6d., or 15 per cent., for the whole of 1934. Both dividends will be payable on January 1, 1936, with the second half of the fixed cumulative dividend on the preference shares.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt as specified in the last available Annual Summary, is also given marked with an *—followed by the date of the Summary, but such total may have been reduced.)

Satisfactions

GEORGE HADFIELD AND CO., LTD., Liverpool, manure mfrs., etc. (M.S., 14/12/35.) Satisfaction reg. Nov. 28. £20,000, outstanding July 1, 1908.

GREAT HALLAZE CHINA CLAY CO., LTD., St. Austell. (M.S., 14/12/35.) Satisfactions reg. Dec. 3, of mort. and debs., reg. July 6, 1922.

JOHN THOM, LTD., Patricroft, artesian well engrs. (M.S., 14/12/35.) Satisfaction reg. Nov. 28, £1,750, reg. Oct 23, 1934.

County Court Judgments

(NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

MATTHEWS PRODUCTS, LTD., 8 Breakspears Road, S.E.4, chemical mfrs. (C.C., 14/12/35.) £22 8s. 8d. Oct. 10.

JONES, ETON, 362 Foundry Lane, Leeds (trading as Metallurgists Co.), metallurgist. (C.C., 14/12/35.) £23 1s. 3d. Nov. 6.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Holland.—An agent established at Amsterdam wishes to obtain the representation, on a commission and also purchasing basis, of United Kingdom manufacturers of pharmaceutical specialities. (Ref. No. 508.)

Sweden.—A recently established agent at Stockholm wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of anti-fouling compositions; insulating material; oil cleaning apparatus; and de-greasing tanks. (Ref. No. 511.)

Egypt.—The Commercial Secretary to the Residency, Egypt, reports that the Egyptian Ministry of Public Works is calling for tenders, to be presented in Cairo by January 11, 1936, for the supply of one refrigerated display cabinet for the Products Laboratory, College of Agriculture, Giza. (Ref. T.Y.5539.)

Cuba.—An agent in Havana desires the representation of suppliers of linseed and paint oils. (Ref. No. 515.)

South Africa.—The British Trade Commissioner at Johannesburg reports that the City Council of Johannesburg is calling for tenders, to be presented in South Africa by January 4, for the supply of approximately 500 imperial gallons of liquid insecticide for deverminising. (Ref. T.Y.184.)

Books Received

Technical Data on Fuel. Edited by H. M. Spiers. London: British National Committee, World Power Conference. Pp. 358.

Official Publications Received

Report of the Water Pollution Research Board for the year ended June 30, 1935. London: H.M. Stationery Office. Pp. 50. 1s.

Chemicals and Allied Products in Canada, 1933. Ottawa: J. O. Patenaude. Pp. 141.

Key Industry Duty

Renewal of Exemptions

THE Treasury has made an Order under Section 10(5) of the Finance Act, 1926, exempting pseudo-cumenol from Key Industry Duty from December 13 to August 19, 1936, and continuing the exemption from Key Industry Duty till August 19, 1936, of the articles in the attached list. The Treasury Order will shortly be published by the Stationery Office.

Compounds of rare earth metals :—celtium oxide ; dysprosium oxide ; erbium oxide ; europium oxide ; gadolinium oxide ; holmium oxide ; lutecium oxide ; samarium oxide ; scandium compounds ; terbium oxide ; thulium oxide ; ytterbium oxide ; yttrium oxide.

Synthetic organic chemicals, analytical reagents, other fine chemicals and chemicals manufactured by fermentation processes :—acid adipinic ; acid dipropyl-malonic ; acid filicic ; acid oxalic ; acid propionic ; acidol (betain hydrochlorate) ; Acyl derivatives of urea, the following :—acid isobutyl allyl barbituric ; N-methyl-C-C-cyclohexenyl methyl malonyl urea ; N-methyl-C-C-cyclohexenyl methyl malonyl urea-sodium ; N-methyl ethyl phenyl malonyl urea ; cyclohexenyl ethyl malonyl urea ; sodium ethyl methyl butyl barbiturate : alcohol amido ethyl ; amido guanidine sulphate ; amidopyrin (pyramidon ; dimethylamidoantipyrine) ; ammonium perchlorate ; barbitone (veronal ; malonal ; malourea ; acid diethyl barbituric ; diethylmalonylurea ; hypnogen ; deba) ; bromural (dormigene) ; butyl esters, the following :—butyl methyl adipate ; calcium gluconate (calcium glyconate) ; cellulose ethers, the following :—ethyl cellulose ; methyl cellulose : chinoline (quinoline) ; chinosol ; cocaine, crude ; coryfin ; cyclohexanol esters and alkyl cyclohexanol esters, the following :—methyl cyclohexanol methyl adipate ; dial (acid dially barbituric) ; dicyandiamide ; didial (ethyl morphine diallyl barbiturate) ; dimethyl sulphate ; diphenyl ; diphenyl oxide ; elbon (cinnamoyl para oxyphenyl urea) ; ethyl esters, the following :—ethyl abietate ; ethylene bromide ; eukodal ; furfural ; germanium oxide ; glycol ethers ; holocaine : lead tetraethyl ; lipoiodin ; melubrin ; mercury compounds, the following :—mercury sodium salicyl allyl amino o-acetate ; metaldehyde ; methyl anthranilate ; methyl esters, the following :—oxymethyl para-oxyphenyl benzylamine methyl sulphate : methyl sulphonal (diethylsulphonemethylethylmethane ; trional) ; methylene chloride ; nickel hydroxide ; organo-arsenic compounds, the following :—copper methyl arsenate ; 4-oxy-3 ethyl amino phenyl arsinic acid-n-methyl tetrahydro pyridine B-carboxylic acid methyl ester : orthoform ; orthoform (new) ; phenazone (antipyrine ; phenyl dimethylpyrazolone ; analgesin ; anodynine ; dimethyl oxychinizin) ; phenetidine, para- ; phloroglucine ; phytin ; piperazine (diethylene-diamine ; dispermin) ; R. potassium chlorate ; potassium ethylxanthogenate (potassium xanthogenate) ; potassium guaiacol sulphonate ; R. potassium hydroxide (R. potassium caustic ; R. potassium hydrate) ; R. potassium permanganate ; pyramidon-veronal ; quinine ethylcarbonate ; radium compounds ; sajodin ; salol (phenyl salicylate) ; salophen ; strontium carbonate ; strontium nitrate ; sulphonal ; synthalin ; theocine (theophylline) ; valyl.

Vanadium compounds : vanadium-silica compounds specially prepared for use as catalysts for sulphuric acid manufacture.

Matches in Palestine

MATCHES are manufactured in Palestine at the Nur Match Factory, situated in Acre, some 13 miles north of the port of Haifa. The annual output is approximately 3,500 cases of matches, each case containing 50 gross boxes and each box approximately 50 matches. The output for the past five years has been : 1930, 145,786 gross boxes of matches ; 1931, 159,485 ; 1932, 138,153 ; 1935, 127,761 ; 1934, 175,758. The increase may be attributed to the increased import duty on mechanical lighters.

Synthetic Wool from Casein

THE manufacture of " synthetic wool " from casein has passed the experimental stage in Italy and is being conducted on an industrial scale. In the manufacture of this new product, casein is subjected to a bath of chemicals in which it is soluble and the resulting viscous solution is forced through small holes which form the "woollen" threads, as in the production of rayon or synthetic silk. It is stated that by June, 1936, the daily output is expected to reach 50,000 lb. daily.

Bulgarian Trade in Pharmaceutical Goods

THE bulk of the pharmaceutical trade in Bulgaria is now in the hands of a co-operative society known as the Bulgarian Pharmacists Co-operative Association. There are 300 members, representing practically all pharmacists in the country, and capital and reserves of £44,500 and deposits of £40,050. Most of the goods of local manufacture are made in the co-operative's own laboratories, and this production is being expanded wherever possible, in order to reduce the proportion of purchases abroad.